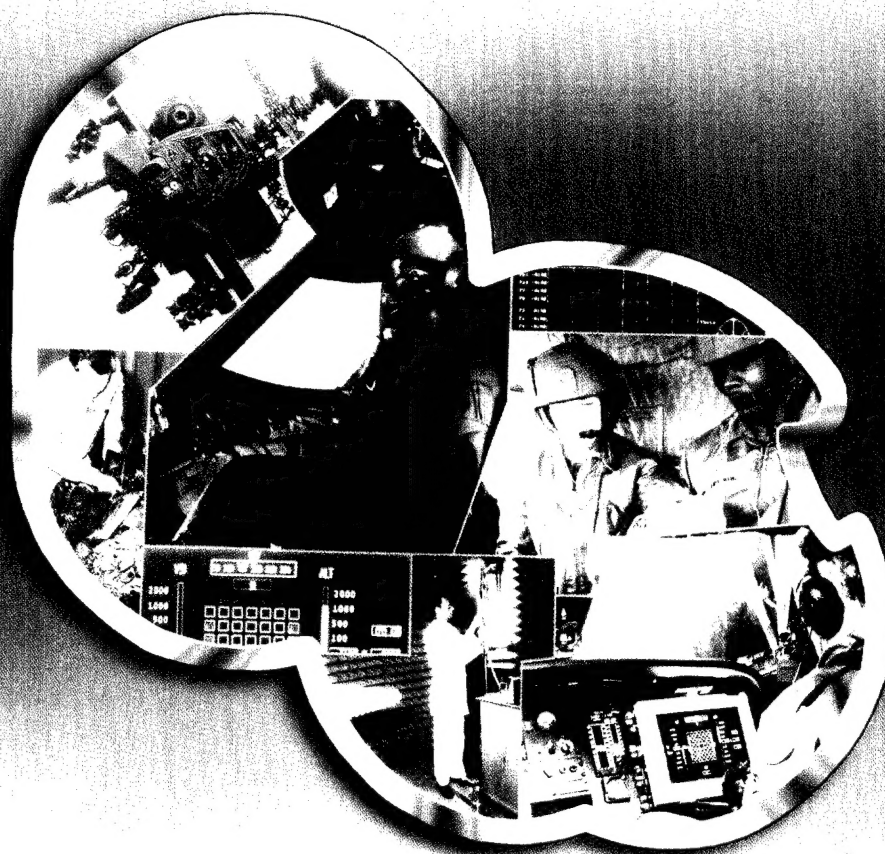


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Noise Protection of the HGU-56/P Aircrew Integrated Helmet System Worn With Eyeglasses

by William A. Ahroon, Elmarce Gordon, and Dale A. Ostler



Aircrew Protection Division

January 2002

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Introduction

The HGU-56/P Aircrew Integrated Helmet System (AIHS) (Figure 1) is designed to provide impact protection and noise attenuation to U.S. Army rotary-wing aircraft crewmembers. It has replaced the 1980's vintage SPH-4B flight helmet and is used by most U.S. Army rotary-wing aircrew flying aircraft other than the AH-64 Apache (which uses a different helmet system). The ability of any helmet to attenuate environmental noise depends on an adequate seal between the earcup and the user's head. Any object or practice that interferes with the seal between the earcup and the head will compromise both helmet retention (with resultant effects on impact protection) and noise attenuation.

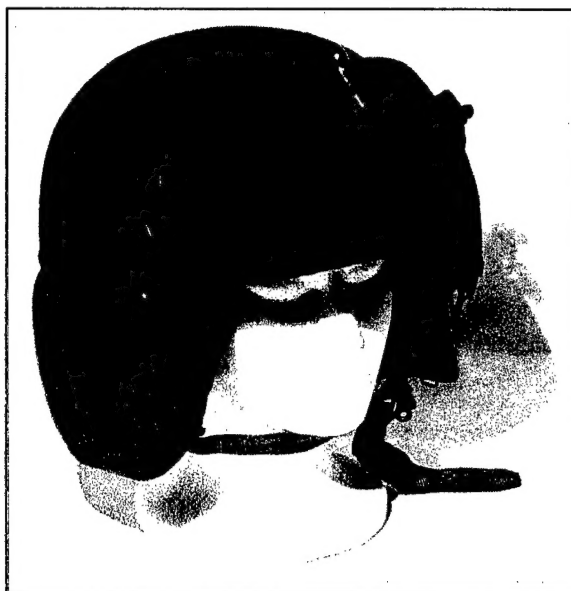


Figure 1. Gentex HGU-56/P AIHS.

Several investigations report that the use of eyeglasses can negatively affect the noise attenuation of an aviator's helmet (Mozo et al., 1974; Nixon and Knoblach, 1974; and Mozo and Murphy, 1997). This paper describes the noise attenuation of the HGU-56/P AIHS when used with six different eyeglass frames, using three different styles of temple pieces: bayonet-style, cable-style, and skull-style (see Figure 2 below).

Method

Testing was performed in accordance with (IAW) the American National Standard Microphone-in-Real-Ear and Acoustic Test Fixture Methods for the Measurement of Insertion Loss of Circumaural Hearing Protection Devices (ANSI S12.42-1995), Microphone-in-Real Ear (MIRE) method. Using miniature microphones positioned at the entrance to the ear canals, noise

levels were measured with and without the HGU-56/P AIHS in place. The difference in the two measurements provided a physical measure of the performance (insertion loss) of the device.

Subjects

Ten subjects (8 male, 2 female) recruited from U.S. Army Aeromedical Research Laboratory (USAARL) personnel were used. The purpose of the study was explained to each subject. Each subject read and signed an informed consent form and then completed a questionnaire regarding his/her hearing health. An otoscopic examination was performed and audiograms were collected on each subject before and after MIRE testing. At any time during this preliminary process, if a subject failed to qualify for ANSI S12.42 MIRE testing, he/she was released. No subjects failed to qualify for the study. Although subjects were permitted to withdraw from the study at any time, no subjects chose to withdraw from the study.

Devices tested

Six different eyeglass frames were tested. Each frame was individually fitted to each subject by an optical laboratory technician¹. The frames, shown in Figure 2, worn with the HGU-56/P AIHS were: Army HGU-4/P aviator spectacle with bayonet-style temples, Army HGU-4/P aviator spectacle with cable-style temples, Air Force Improved Aircrew Spectacle (IAS) with skull-style temples, Navy Flight Goggle (FG) with bayonet-style temples, Navy FG with cable-style temples, and Navy FG with skull-style temples. The order of testing of the frames was randomized. The insertion loss of the HGU-56/P AIHS was also measured when worn without eyeglass frames.

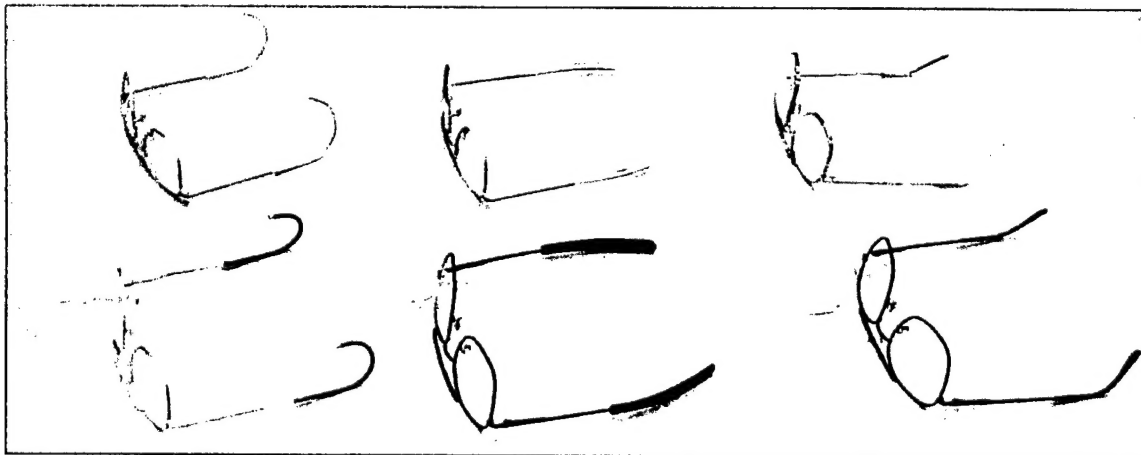


Figure 2. Eyeglass frames used in this protocol. Top row (left to right): HGU-4/P with cable-style temples, HGU-4/P with bayonet-style temples, IAS with skull-style temples. Bottom row (left to right): FG with cable-style temples, FG with bayonet-style temples, and FG with skull-style temples.

¹ We acknowledge the contributions of SSG Rafael Rodriguez in the conduct of this study.

Equipment

The MIRE test procedure utilized Knowles Model 1832 electret microphones, a Larson-Davis Model 3100 Real Time Analyzer (RTA), an Altec Model 1594 Power Amplifier, and three Altec Model 612C speakers. Figure 3 presents a schematic of the experimental setup: The sound field created by the system described satisfied the stimulus conditions mandated by ANSI S12.42-1995. Control of the test procedure was performed by a general-purpose computer running custom software developed at USAARL. The software directed the RTA to turn on and off a wide-band noise field and to retrieve the one-third octave band data from the RTA.

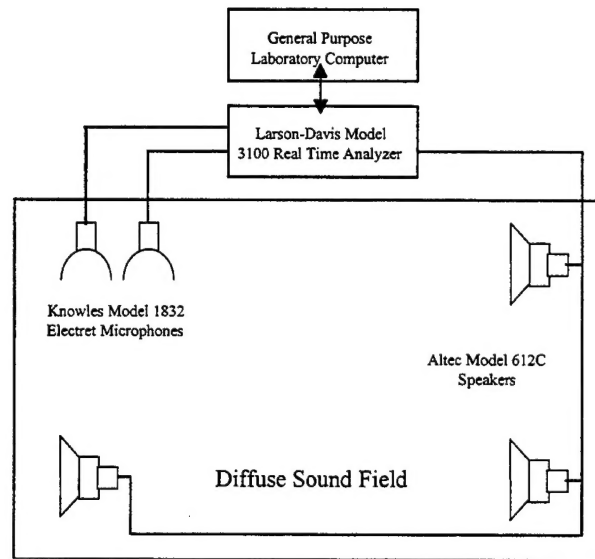


Figure 3. Schematic representation of the equipment used for microphone-in-real-ear test.

Procedure

At the start of a test session, each subject was fitted with silicone moldable earplugs (Flents Products, Silaflex™ No. 901), which served both as a hearing protector and a convenient medium for mounting the microphone. The subject was then seated in a hard-walled (reverberant) sound room. A non-directional sound field of wideband noise at approximately 105 dBA sound pressure level (SPL) was presented and unoccluded reference data were collected. To obtain these data, the noise signal was measured by the microphones in the subject's ears, the RTA performed the two-channel third-octave band analysis, and the results were retrieved from the RTA and stored by the computer for later analysis. Thirty third-octave bands with center frequencies from 25 Hz to 20,000 Hz were used. The sound field was then turned off and the subject donned the HGU-56/P AIHS with the selected eyeglass frames. The sound field again was turned on and the noise signal was measured, analyzed, and stored in a like manner. The noise was measured, analyzed, and results stored after the subject doffed and donned the helmet and eyeglass frames two additional times, thus providing three measures of unoccluded and three

measures of occluded noise levels for each subject. The algebraic difference between the mean of the three open and three occluded measurements for each one-third-octave band was defined as the insertion loss of the device IAW ANSI S12.42-1995.

The total noise exposure for each subject was approximately 6 minutes for the entire experiment. For the unprotected ear, Department of Defense (DOD_ Instruction 6055.12, "Hearing Conservation," limits allowable exposure time for a single 24-hour period for 105 dBA SPL (e.g., A-weighted SPL) to 32 minutes. The moldable earplug used in the measurement extended the maximum allowable exposure time to more than 16 hours. Thus, the subjects' hearing was not considered at risk from the noise exposures encountered during this experiment.

A head-positioning device consisting of a string suspended from the test booth ceiling down to a level approximately equal to the elevation of a subject's nose was used to maintain the subject's head at the stimulus reference point, the point where stimulus calibration was performed. During testing, subjects were observed over a closed-circuit television and notes made regarding correct use of the eyeglass frames and helmet.

Statistical analyses were performed using STATISTICA[®] Release 5 from StatSoft[®], Inc. The probability of a Type I error was set at 0.05 for all analyses.

Results

The insertion losses for the left and right ears of the HGU-56/P AIHS worn with the six different styles of eyeglass frames are illustrated in Figure 4. Three-way repeated measures analyses of variance with repeated measures on all factors (Ear \times Frame \times Frequency) were performed on the mean insertion losses within each frame style. Analysis of variance summary tables are presented in Tables 1-3. There were no statistically significant main effects of test ear or frame (HGU-4/P, IAS, FG) for any of the three analyses. There were statistically significant main effects of frequency in all three analyses, which is expected based on our knowledge of the frequency-specific noise attenuation of the HGU-56/P AIHS. There also were statistically significant interactions of test ear and frequency for the bayonet and cable frame types, indicating that there was an effect of ear for these type frames, but that effect was dependent on the third-octave band center frequency. To illustrate these differences, the mean left and right ear insertion loss of the AIHS when worn with the three frame types are presented in Figure 5. Duncan's multiple-range² post-hoc analyses revealed that, for the bayonet and cable frame types, the statistically significant interactions were the result of significantly greater insertion loss in the left ear for the three third-octave bands with center frequencies below 50 Hz. While the Ear \times Frequency interaction for the skull-style eyeglass frames was not statistically significant, a similar post-hoc analysis of the skull-style frame left-right ear insertion loss data revealed statistically significant differences at the 25 Hz and 12,500 Hz third-octave band center-frequency test regions. We concluded that, while there were selected statistically significant differences in the insertion losses between the two ears at the extremely low third-octave band

² The Duncan's multiple-range test was used for post-hoc comparisons because only a limited set of comparisons, those between mean insertion loss at the same frequencies, were of interest in these analyses (see Keppel, 1973).

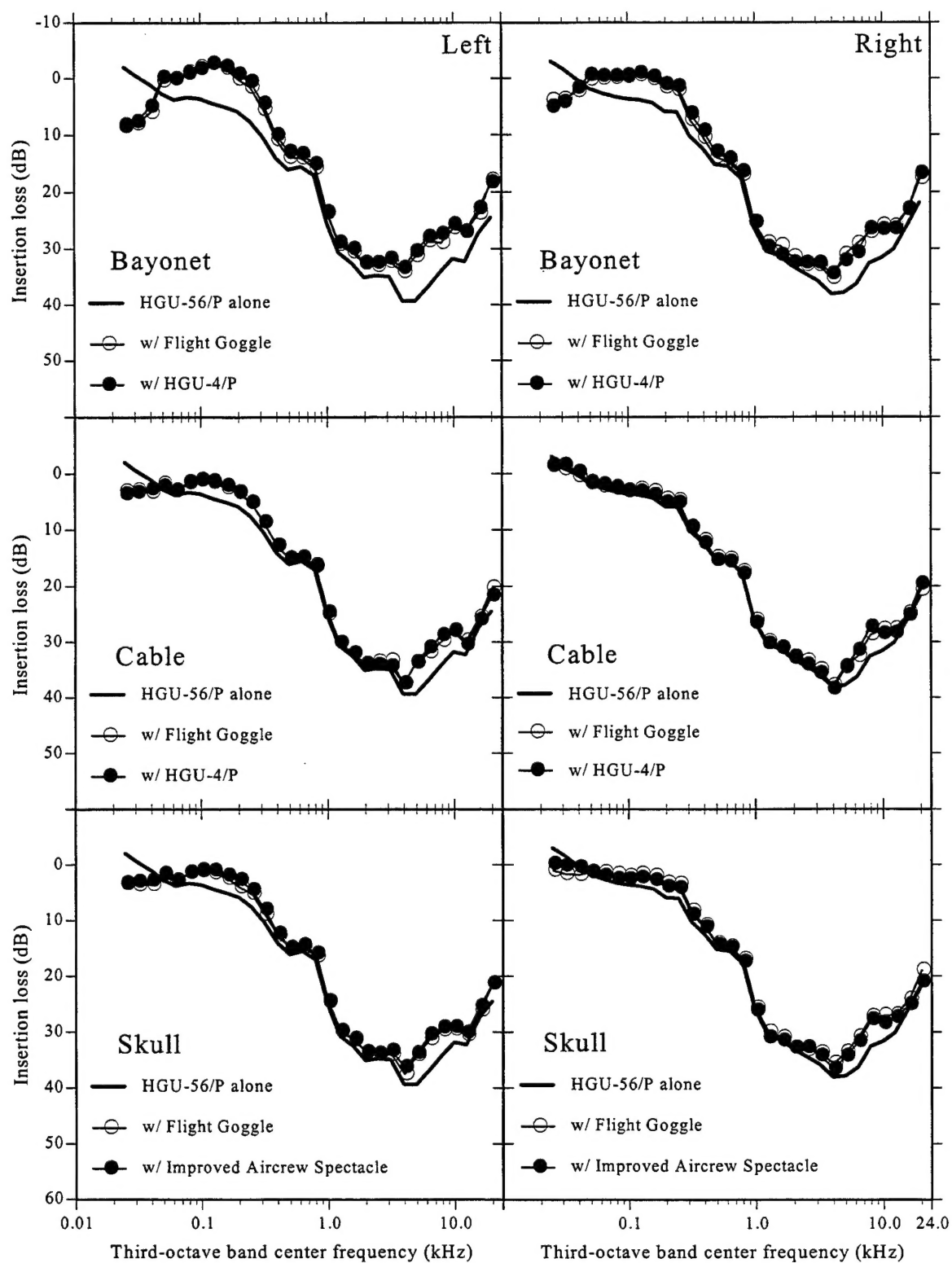


Figure 4. Mean insertion loss values (in dB) for the left and right ears of subjects wearing the HGU-56/P AIHS and different style eyeglass frames.

Table 1.
Analysis of variance summary table for the bayonet-style eyeglass frames.

| Effect | <i>df</i> Effect | <i>MS</i> Effect | <i>df</i> Error | <i>MS</i> Error | <i>F</i> | <i>p</i> |
|-------------------------|---------------------|---------------------|--------------------|--------------------|----------|----------|
| Ear | 1 | 2.944 | 9 | 131.8017 | .0223 | .884498 |
| Frame | 1 | 26.235 | 9 | 17.2761 | 1.5186 | .249054 |
| Frequency | 29 | 6945.542 | 261 | 48.1365 | 144.2886 | .000000 |
| Ear × Frame | 1 | 13.223 | 9 | 14.1169 | .9367 | .358421 |
| Ear × Frequency | 29 | 25.427 | 261 | 11.0905 | 2.2927 | .000326 |
| Frame × Frequency | 29 | 2.290 | 261 | 2.3505 | .9744 | .507689 |
| Ear × Frame × Frequency | 29 | 1.749 | 261 | 1.7315 | 1.0101 | .456149 |

Table 2.
Analysis of variance summary table for the cable-style eyeglass frames.

| Effect | <i>df</i> Effect | <i>MS</i> Effect | <i>df</i> Error | <i>MS</i> Error | <i>F</i> | <i>p</i> |
|-------------------------|---------------------|---------------------|--------------------|--------------------|----------|----------|
| Ear | 1 | 7.275 | 9 | 71.39978 | .1019 | .756859 |
| Frame | 1 | 1.802 | 9 | 18.24541 | .0988 | .760488 |
| Frequency | 29 | 7173.900 | 261 | 49.65783 | 144.4666 | .000000 |
| Ear × Frame | 1 | .026 | 9 | 14.84254 | .0018 | .967252 |
| Ear × Frequency | 29 | 27.895 | 261 | 9.62202 | 2.8991 | .000004 |
| Frame × Frequency | 29 | 1.670 | 261 | 3.01198 | .5545 | .970690 |
| Ear × Frame × Frequency | 29 | 1.073 | 261 | 1.98879 | .5394 | .975901 |

Table 3.
Analysis of variance summary table for the skull-style eyeglass frames.

| Effect | <i>df</i> Effect | <i>MS</i> Effect | <i>df</i> Error | <i>MS</i> Error | <i>F</i> | <i>p</i> |
|-------------------------|---------------------|---------------------|--------------------|--------------------|----------|----------|
| Ear | 1 | 90.146 | 9 | 180.8641 | .4984 | .498062 |
| Frame | 1 | .001 | 9 | 17.0004 | .0001 | .993299 |
| Frequency | 29 | 7044.092 | 261 | 55.6331 | 126.6170 | .000000 |
| Ear × Frame | 1 | 50.307 | 9 | 15.8787 | 3.1682 | .108785 |
| Ear × Frequency | 29 | 14.690 | 261 | 12.5827 | 1.1675 | .260044 |
| Frame × Frequency | 29 | 1.707 | 261 | 2.1736 | .7851 | .779263 |
| Ear × Frame × Frequency | 29 | 1.683 | 261 | 1.1578 | 1.4533 | .068218 |

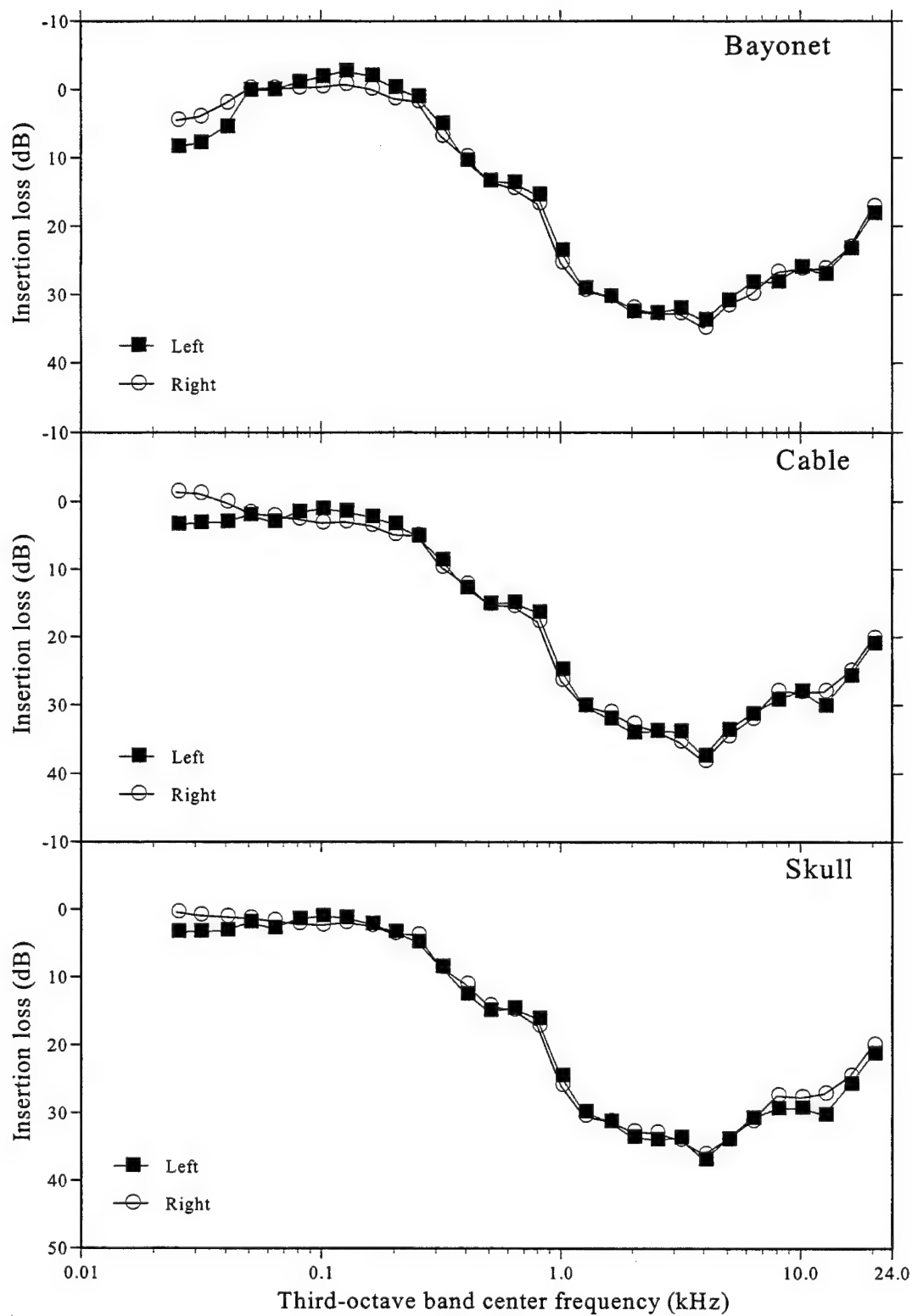


Figure 5. Mean insertion loss values (in dB) for the left and right ears of subjects wearing the HGU-56/P AIHS and three different types of eyeglass frames.

center-frequency test regions, these differences were not appreciable and would not affect decisions regarding the operational use of these devices.

Of particular interest are the differences between the three styles of eyeglass frames. These differences can be best visualized by comparing the difference between the insertion loss of the HGU-56/P AIHS worn without the eyeglass frames and the insertion loss of the helmet when worn with the different frames. Such differences are illustrated in Figure 6. It is clear that the use of each type of eyeglass frame degrades the sound protection provided by the HGU-56/P AIHS. Table 4 presents the summary table for a two-way analysis of variance with repeated measures on both factors. In this analysis, data were collapsed across ear and frame type such that, for each subject, the three dependent variables were the mean of the left and right insertion losses for the two bayonet-, two cable-, and two skull-style eyeglass frames. Duncan multiple-range post-hoc comparisons of the means revealed no statistically significant differences in mean insertion losses between the cable- and skull-style eyeglass frames. The post-hoc comparisons did reveal differences between the mean insertion losses when wearing bayonet-style frames and when wearing the other two types of frames. The bars on the lower portion of Figure 6 indicate the statistically significant results of these comparisons. Thus, the use of the bayonet-style eyeglass frame with the HGU-56/P AIHS results in less noise protection than if the helmet is worn with the other types of frames through most of the frequency region except approximately 600 Hz to 2,500 Hz and at 8,000 Hz. Certainly head anthropometry and spectacle size will affect the AIHS noise protection, although it is likely that bayonet-style frames will impact the noise protection more than the other frame styles in most (if not all) cases.

Each of the eyeglass frames appears to improve the insertion loss of the HGU-56/P AIHS at the extreme lowest third-octave band center frequencies. One explanation for this result is that the normal acoustic pressures caused by reverberation of the earcup at very low frequencies is reduced as the eyeglass frame compromises the tight seal between the helmet earcup and the head. At very low frequencies, this reverberation is an important contributor to the noise measured at the ear canal, while at higher frequencies, earcup reverberation is quite minor and does not contribute to the acoustic energy inside of the earcup. It is likely, however, that the differences in helmet attenuation at the very low frequencies will not appreciably effect the operational capabilities of the AIHS since the A-weighted corrections at these third-octave band frequencies are -34.63, -39.44 and -44.70 dB for the 40, 31 and 25 Hz band center frequencies respectively (ANSI S1.4-1986).

Discussion

The use of ancillary devices with the HGU-56/P AIHS is known to degrade the sound attenuation of the flight helmet (Mozo & Murphy, 1997). The selection of eyeglass frame type for use with the HGU-56/P AIHS should be made with this knowledge in mind. If aircrew are using earplugs in addition to the sound-attenuating flight helmet as recommended for some aircraft [see the technical manual (TM 1-1520-237-10) for the UH-60A Black Hawk], then the selection of eyeglass frames will not impact the total noise protection appreciably (Berger, 1983). Under other circumstances, however, when earplugs are not required and/or used, the decision to use the different types of eyeglass frames will have an effect on operational

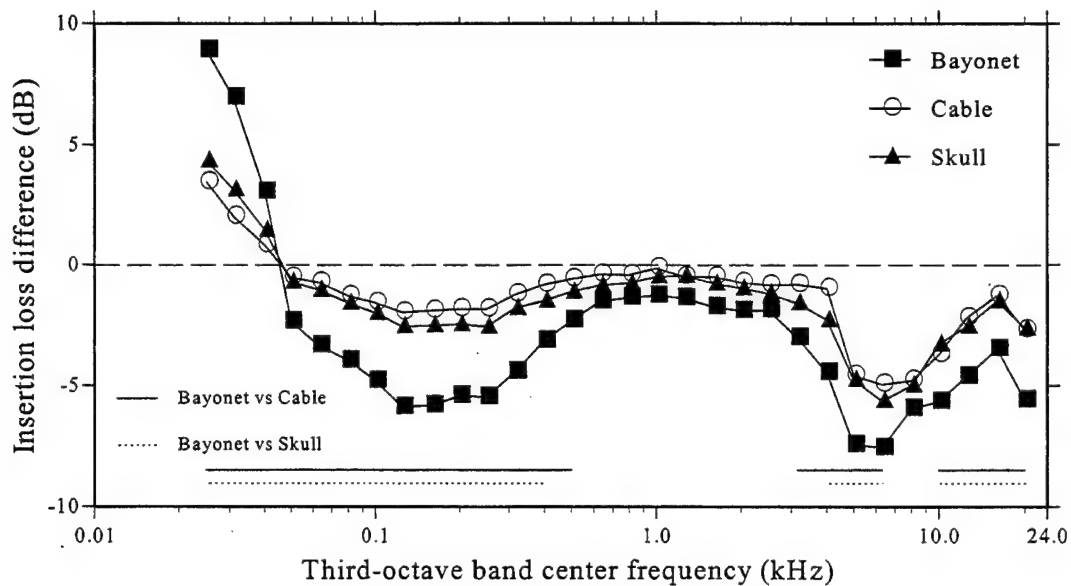


Figure 6. Mean difference in insertion loss values (in dB) between the HGU-56/P AIHS and the AIHS worn with the three different types of eyeglass frames.

Table 4.

Analysis of variance summary table for all eyeglass frames collapsed across test ear.

| Effect | <i>df</i> Effect | <i>MS</i> Effect | <i>df</i> Error | <i>MS</i> Error | <i>F</i> | <i>p</i> |
|--------------------|---------------------|---------------------|--------------------|--------------------|----------|----------|
| Frames | 2 | 233.7228 | 18 | 17.29696 | 13.51236 | .000261 |
| Frequency | 29 | 179.3233 | 261 | 12.03985 | 14.89415 | .000000 |
| Frames × Frequency | 58 | 14.4485 | 522 | 2.02416 | 7.13800 | .000000 |

capabilities. For example, IAW DODI 6055.12, the maximum duration that the co-pilot of an OH-58C can fly at 90 knots, with aircraft doors on, soundproofing (i.e., acoustical blankets) in, and heater off is essentially unlimited (e.g., 24 hr/day). Using the 3-dB time-intensity exchange rate recommended by DODI 6055.12, this duration is only slightly reduced when using cable-style eyeglass frames (23.7 hr/day) or skull-style frames (20.6 hr/day). However, the duration of maximum permissible safe exposure to this noise under the stated flight conditions is more than cut in half to 10.6 hours per day when bayonet-style eyeglass frames are worn with the HGU-56/P AIHS. Thus, the use of bayonet-style eyeglass frames can reduce the noise protection of the HGU-56/P AIHS in certain, perhaps not very unusual, circumstances. That is, in aircraft where double hearing protection is not mandated (e.g., OH-58C), the use of bayonet-style eyeglass frame can put the hearing of aircrew at risk. Aircrew should be cognizant of the limitations of the helmet to protect hearing when ancillary devices are worn and make responsible decisions regarding additional hearing protection (i.e., double-protection).

Conclusions

The use of ancillary devices such as eyeglass frames may result in sizeable reductions of the HGU-56/P AIHS noise attenuation. When the HGU-56/P AIHS is worn without the additional hearing protection afforded by pre-molded or expandable-foam earplugs or by the Communications Earplug (Mozo & Murphy, 1997), aircrew should select an appropriate eyeglass frame which will not reduce operational capabilities. USAARL recommends that bayonet-style eyeglass frames not be used with the HGU-56/P AIHS without the additional hearing protection afforded by earplugs.

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Appendices

- Appendix A. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn without eyeglass frames measured IAW ANSI S12.42-1995.
- Appendix B. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with bayonet-style temples measured IAW ANSI S12.42-1995.
- Appendix C. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Army HGU-4/P aviator spectacle bayonet-style temples measured IAW ANSI S12.42-1995.
- Appendix D. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with cable-style temples measured IAW ANSI S12.42-1995.
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- Appendix F. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with skull-style temples measured IAW ANSI S12.42-1995.
- Appendix G. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Air Force IAS with skull-style temples measured IAW ANSI S12.42-1995.

Appendix A. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn without eyeglass frames measured IAW ANSI S12.42-1995.

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | 2.5 Hz | 3.1 Hz | 4.0 Hz | 5.0 Hz | 6.3 Hz | 8.0 Hz | 100 Hz | 125 Hz | 160 Hz | 200 Hz |
| 01 | Left | -8.97 | -3.63 | 2.77 | 5.53 | 5.90 | 6.13 | 5.80 | 7.57 | 8.07 | 8.70 |
| 01 | Right | -12.87 | -10.60 | -2.93 | 7.40 | 9.07 | 10.87 | 10.67 | 10.50 | 10.03 | 13.27 |
| 02 | Left | -6.73 | -1.30 | -3.70 | 1.77 | 2.93 | 3.13 | 3.87 | 4.20 | 4.57 | 4.57 |
| 02 | Right | -9.77 | -9.47 | -5.90 | 1.63 | 0.90 | 0.63 | 0.97 | -0.27 | -0.13 | 2.77 |
| 03 | Left | 6.57 | 6.50 | 7.17 | 3.10 | 2.03 | 0.13 | 0.47 | -0.63 | -0.07 | 2.93 |
| 03 | Right | 6.03 | 4.40 | 4.23 | -0.10 | 0.27 | 0.17 | 0.47 | -1.37 | -0.87 | -1.37 |
| 04 | Left | -1.83 | -1.73 | 0.93 | 5.40 | 8.70 | 5.47 | 4.17 | 4.37 | 5.23 | 7.23 |
| 04 | Right | -7.57 | -5.23 | 0.70 | 3.87 | 6.80 | 7.83 | 8.60 | 10.90 | 11.77 | 13.87 |
| 05 | Left | 7.47 | 8.47 | 6.03 | -2.93 | -2.57 | -2.87 | -3.93 | -4.80 | -4.50 | -2.57 |
| 05 | Right | 9.63 | 9.17 | 4.47 | -1.27 | -1.13 | -1.43 | -2.97 | -4.07 | -4.37 | -3.93 |
| 06 | Left | -5.30 | -6.67 | -6.03 | 1.60 | 4.63 | 4.43 | 5.63 | 6.83 | 7.73 | 6.43 |
| 06 | Right | -2.70 | -3.50 | -2.87 | 0.63 | 1.93 | 1.93 | 2.50 | 4.73 | 6.70 | 7.70 |
| 07 | Left | -8.37 | -7.27 | -3.57 | 3.07 | 7.43 | 8.47 | 9.50 | 10.80 | 12.17 | 10.90 |
| 07 | Right | -12.83 | -7.23 | -0.40 | 7.20 | 9.03 | 10.37 | 11.67 | 11.17 | 11.03 | 11.67 |
| 08 | Left | -0.37 | -0.23 | 1.60 | 1.23 | 0.87 | 1.73 | 2.97 | 4.07 | 4.43 | 6.37 |
| 08 | Right | 2.10 | 4.93 | 3.07 | -2.30 | -2.07 | -1.20 | -1.60 | -2.17 | -1.97 | -0.13 |
| 09 | Left | -1.43 | 2.13 | 5.27 | 7.90 | 6.37 | 4.23 | 5.73 | 7.27 | 8.43 | 9.43 |
| 09 | Right | -0.73 | 0.37 | 1.80 | 1.80 | 1.60 | 1.67 | 2.83 | 4.37 | 5.67 | 7.80 |
| 10 | Left | -0.07 | -0.03 | 0.97 | 1.80 | 3.03 | 3.30 | 2.90 | 5.30 | 5.93 | 5.43 |
| 10 | Right | -0.23 | 1.33 | 1.53 | 0.70 | 1.40 | 3.23 | 4.57 | 5.70 | 7.03 | 8.60 |
| Insertion Loss (L) | Mean | -1.90 | -0.38 | 1.14 | 2.85 | 3.93 | 3.42 | 3.71 | 4.50 | 5.20 | 5.94 |
| | s | 5.70 | 5.08 | 4.44 | 2.97 | 3.37 | 3.20 | 3.59 | 4.42 | 4.68 | 3.80 |
| Insertion Loss (R) | Mean | -2.89 | -1.58 | 0.37 | 1.96 | 2.78 | 3.41 | 3.77 | 3.95 | 4.49 | 6.02 |
| | s | 7.75 | 6.65 | 3.40 | 3.28 | 4.05 | 4.62 | 5.05 | 5.72 | 5.86 | 6.33 |

Appendix A (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|--------|--------|--------|--------|--------|---------|---------|---------|---------|
| | | 250 Hz | 315 Hz | 400 Hz | 500 Hz | 630 Hz | 800 Hz | 1000 Hz | 1250 Hz | 1600 Hz | 2000 Hz |
| 01 | Left | 10.90 | 12.77 | 14.73 | 14.90 | 15.33 | 18.53 | 24.73 | 28.30 | 33.40 | 34.57 |
| 01 | Right | 15.03 | 18.33 | 19.00 | 18.30 | 16.80 | 19.23 | 26.47 | 30.87 | 35.37 | 35.83 |
| 02 | Left | 6.80 | 7.93 | 12.13 | 14.10 | 13.03 | 13.13 | 22.13 | 26.83 | 28.80 | 30.27 |
| 02 | Right | 3.50 | 7.90 | 9.60 | 11.80 | 10.97 | 12.90 | 20.10 | 27.50 | 30.10 | 32.27 |
| 03 | Left | -0.03 | 3.70 | 10.40 | 14.17 | 12.53 | 14.60 | 22.20 | 30.33 | 33.27 | 35.47 |
| 03 | Right | -1.03 | 3.33 | 6.90 | 11.30 | 12.27 | 15.60 | 25.53 | 28.33 | 29.27 | 33.40 |
| 04 | Left | 9.67 | 15.97 | 16.80 | 17.77 | 14.27 | 17.13 | 24.40 | 27.63 | 28.90 | 31.07 |
| 04 | Right | 12.83 | 17.13 | 16.93 | 20.40 | 17.77 | 18.53 | 27.70 | 33.03 | 31.20 | 31.33 |
| 05 | Left | -1.90 | 1.30 | 8.27 | 12.67 | 14.97 | 14.43 | 23.63 | 28.33 | 33.17 | 37.23 |
| 05 | Right | -3.23 | 1.70 | 4.27 | 9.13 | 11.07 | 11.63 | 19.93 | 24.63 | 30.60 | 34.97 |
| 06 | Left | 11.03 | 12.70 | 18.83 | 21.00 | 21.77 | 21.33 | 28.27 | 33.97 | 37.60 | 39.27 |
| 06 | Right | 8.37 | 12.63 | 15.63 | 19.03 | 20.83 | 23.07 | 31.33 | 33.70 | 34.03 | 33.97 |
| 07 | Left | 13.77 | 16.83 | 18.57 | 20.53 | 22.97 | 25.03 | 33.43 | 38.00 | 36.97 | 38.00 |
| 07 | Right | 11.53 | 16.60 | 20.93 | 22.83 | 24.67 | 27.47 | 35.03 | 34.33 | 31.70 | 34.53 |
| 08 | Left | 9.47 | 11.43 | 14.73 | 16.27 | 12.07 | 15.53 | 25.13 | 31.60 | 33.93 | 40.40 |
| 08 | Right | 1.17 | 5.93 | 9.83 | 13.47 | 13.13 | 15.17 | 21.83 | 28.67 | 33.30 | 34.43 |
| 09 | Left | 9.43 | 12.23 | 14.93 | 16.83 | 16.57 | 17.37 | 25.93 | 36.17 | 30.73 | 32.93 |
| 09 | Right | 6.20 | 10.47 | 12.23 | 15.47 | 16.60 | 19.40 | 29.03 | 31.83 | 28.70 | 30.00 |
| 10 | Left | 8.10 | 9.90 | 12.53 | 14.27 | 13.33 | 14.97 | 23.30 | 26.93 | 30.07 | 33.13 |
| 10 | Right | 7.37 | 9.53 | 10.07 | 12.00 | 12.73 | 15.43 | 25.97 | 32.60 | 31.37 | 31.93 |
| Insertion Loss (L) | Mean | 7.72 | 10.48 | 14.19 | 16.25 | 15.68 | 17.21 | 25.32 | 30.81 | 32.68 | 35.23 |
| | s | 4.96 | 4.96 | 3.42 | 2.81 | 3.79 | 3.64 | 3.38 | 4.01 | 3.08 | 3.45 |
| Insertion Loss (R) | Mean | 6.17 | 10.36 | 12.54 | 15.37 | 15.68 | 17.84 | 26.29 | 30.55 | 31.56 | 33.27 |
| | s | 6.06 | 5.81 | 5.41 | 4.55 | 4.52 | 4.78 | 4.84 | 3.15 | 2.12 | 1.83 |

Appendix A (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| | | 2500 Hz | 3150 Hz | 4000 Hz | 5000 Hz | 6300 Hz | 8000 Hz | 10000 Hz | 12500 Hz | 16000 Hz | 20000 Hz |
| 01 | Left | 40.20 | 44.50 | 46.90 | 49.57 | 46.10 | 44.93 | 33.03 | 32.37 | 30.27 | 29.97 |
| 01 | Right | 43.33 | 44.53 | 46.83 | 49.67 | 50.47 | 46.67 | 37.47 | 36.73 | 33.77 | 29.87 |
| 02 | Left | 31.63 | 35.37 | 39.37 | 34.97 | 30.00 | 24.33 | 24.63 | 28.77 | 26.07 | 20.00 |
| 02 | Right | 29.70 | 31.93 | 33.37 | 26.17 | 25.53 | 22.23 | 28.20 | 29.23 | 25.37 | 21.17 |
| 03 | Left | 32.07 | 28.83 | 35.57 | 35.00 | 31.00 | 32.43 | 32.33 | 33.07 | 27.10 | 20.00 |
| 03 | Right | 29.17 | 25.77 | 30.17 | 25.33 | 25.57 | 22.93 | 25.53 | 24.07 | 22.53 | 16.67 |
| 04 | Left | 38.43 | 35.87 | 39.43 | 35.87 | 37.03 | 30.97 | 25.87 | 28.97 | 27.37 | 26.57 |
| 04 | Right | 33.17 | 36.43 | 41.87 | 41.13 | 40.40 | 43.53 | 39.87 | 34.03 | 27.20 | 29.83 |
| 05 | Left | 23.77 | 23.60 | 32.97 | 33.60 | 28.17 | 28.83 | 31.90 | 27.87 | 27.53 | 20.20 |
| 05 | Right | 27.33 | 29.07 | 26.83 | 29.37 | 31.03 | 28.33 | 30.50 | 28.07 | 21.07 | 10.00 |
| 06 | Left | 39.43 | 40.63 | 41.37 | 38.53 | 35.70 | 31.90 | 25.97 | 29.10 | 25.90 | 29.80 |
| 06 | Right | 36.17 | 40.07 | 43.00 | 43.30 | 36.93 | 32.00 | 31.87 | 31.30 | 26.23 | 22.93 |
| 07 | Left | 37.23 | 40.63 | 44.17 | 47.77 | 45.83 | 41.03 | 38.67 | 36.63 | 29.37 | 30.00 |
| 07 | Right | 39.13 | 43.37 | 50.60 | 51.57 | 46.90 | 43.37 | 35.90 | 26.60 | 23.53 | 29.73 |
| 08 | Left | 35.83 | 32.10 | 40.40 | 44.83 | 42.77 | 41.07 | 37.23 | 35.80 | 25.60 | 20.00 |
| 08 | Right | 34.40 | 33.37 | 39.97 | 40.67 | 40.73 | 32.33 | 29.37 | 32.13 | 28.13 | 20.00 |
| 09 | Left | 36.93 | 34.80 | 34.83 | 32.13 | 29.43 | 33.00 | 37.20 | 37.23 | 28.30 | 26.70 |
| 09 | Right | 39.23 | 38.83 | 34.60 | 33.27 | 24.23 | 24.80 | 25.70 | 25.63 | 23.80 | 20.03 |
| 10 | Left | 33.43 | 34.63 | 39.37 | 42.67 | 43.73 | 34.13 | 32.47 | 34.33 | 27.13 | 23.23 |
| 10 | Right | 33.83 | 35.53 | 35.17 | 39.43 | 42.63 | 30.70 | 33.27 | 34.73 | 28.17 | 20.00 |
| Insertion Loss (L) | Mean s | 34.90 | 35.10 | 39.44 | 39.49 | 36.98 | 34.26 | 31.93 | 32.41 | 27.46 | 24.65 |
| | s | 4.90 | 6.07 | 4.23 | 6.26 | 7.16 | 6.28 | 5.04 | 3.55 | 1.50 | 4.45 |
| Insertion Loss (R) | Mean s | 34.55 | 35.89 | 38.24 | 37.99 | 36.44 | 32.69 | 31.77 | 30.25 | 25.98 | 22.02 |
| | s | 5.05 | 6.04 | 7.51 | 9.22 | 9.39 | 8.93 | 4.87 | 4.21 | 3.63 | 6.40 |

Appendix B. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worm with U.S. Navy FG with bayonet-style temples measured IAW ANSI S12.42-1995.

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|-------|-------|-------|-------|-------|--------|--------|--------|--------|
| | | 25 Hz | 31 Hz | 40 Hz | 50 Hz | 63 Hz | 80 Hz | 100 Hz | 125 Hz | 160 Hz | 200 Hz |
| 01 | Left | 7.83 | 9.17 | 7.27 | -1.23 | -1.47 | -1.20 | -1.80 | -1.90 | -1.97 | -0.73 |
| 01 | Right | -4.00 | -5.27 | -1.40 | -0.27 | 0.30 | 1.93 | 3.00 | 6.60 | 7.43 | 8.43 |
| 02 | Left | 10.10 | 9.63 | 5.13 | 2.30 | 0.57 | -1.43 | -2.90 | -4.43 | -3.97 | -3.07 |
| 02 | Right | -1.70 | -0.87 | -1.67 | 2.27 | 0.70 | -0.43 | -1.20 | -3.27 | -2.70 | -0.93 |
| 03 | Left | 12.30 | 12.23 | 9.83 | 2.17 | 1.63 | -0.67 | -1.13 | -2.37 | -1.93 | 0.00 |
| 03 | Right | 2.73 | 2.23 | 4.70 | 1.73 | 1.40 | 1.20 | 1.27 | 0.37 | 0.80 | 1.70 |
| 04 | Left | 12.83 | 11.17 | 7.70 | 2.07 | 1.33 | -0.60 | -1.67 | -3.97 | -2.37 | 3.17 |
| 04 | Right | -1.07 | -2.53 | -2.33 | -1.13 | 0.17 | 0.43 | 2.33 | 4.17 | 5.43 | 8.43 |
| 05 | Left | 9.07 | 9.00 | 7.77 | -2.63 | -2.53 | -2.63 | -2.60 | -4.30 | -5.33 | -5.67 |
| 05 | Right | 9.43 | 9.40 | 4.97 | -0.90 | -1.13 | -1.63 | -2.27 | -4.53 | -5.43 | -5.07 |
| 06 | Left | 9.40 | 8.17 | 7.77 | 2.70 | 1.40 | -0.67 | -4.23 | -7.70 | -7.47 | -6.00 |
| 06 | Right | 12.83 | 11.23 | 5.43 | 0.37 | -0.67 | -0.93 | -2.13 | -3.60 | -2.27 | -0.10 |
| 07 | Left | -7.67 | -8.03 | -6.30 | 0.17 | 2.23 | 1.50 | 1.83 | 4.57 | 6.80 | 9.23 |
| 07 | Right | -5.43 | -2.60 | -1.80 | 0.67 | 0.90 | 1.17 | 1.63 | 4.07 | 6.27 | 6.33 |
| 08 | Left | 10.77 | 9.50 | 6.70 | -1.97 | -2.20 | -2.70 | -3.00 | -2.30 | -0.83 | 1.47 |
| 08 | Right | 7.00 | 8.63 | 4.57 | -1.37 | -1.23 | -1.13 | -2.13 | -3.50 | -3.77 | -3.07 |
| 09 | Left | 9.77 | 10.83 | 9.17 | 2.77 | 2.07 | -0.33 | -0.70 | -1.47 | 0.17 | 3.53 |
| 09 | Right | 8.07 | 7.47 | 5.20 | 1.33 | 0.77 | -0.17 | -0.63 | -2.47 | -1.97 | 0.50 |
| 10 | Left | 11.20 | 8.50 | 5.53 | -1.87 | -2.10 | -2.03 | -3.43 | -2.60 | -1.30 | -0.43 |
| 10 | Right | 11.73 | 10.10 | 5.33 | 0.43 | -0.27 | -0.83 | -1.90 | -3.27 | -2.33 | 0.10 |
| Insertion Loss (L) | Mean | 8.56 | 8.02 | 6.06 | 0.45 | 0.09 | -1.08 | -1.96 | -2.65 | -1.82 | 0.15 |
| | s | 5.89 | 5.78 | 4.57 | 2.19 | 1.94 | 1.24 | 1.72 | 3.12 | 3.78 | 4.57 |
| Insertion Loss (R) | Mean | 3.96 | 3.78 | 2.30 | 0.31 | 0.09 | -0.04 | -0.20 | -0.54 | 0.15 | 1.63 |
| | s | 6.71 | 6.24 | 3.55 | 1.24 | 0.89 | 1.18 | 2.05 | 4.05 | 4.59 | 4.65 |

Appendix B (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|--------|--------|--------|--------|--------|---------|---------|---------|---------|
| | | 250 Hz | 315 Hz | 400 Hz | 500 Hz | 630 Hz | 800 Hz | 1000 Hz | 1250 Hz | 1600 Hz | 2000 Hz |
| 01 | Left | 1.40 | 4.53 | 7.43 | 9.17 | 11.43 | 14.77 | 22.70 | 25.73 | 29.70 | 31.73 |
| 01 | Right | 10.47 | 14.93 | 16.63 | 16.83 | 16.87 | 19.23 | 26.73 | 30.07 | 32.97 | 34.43 |
| 02 | Left | 0.30 | 3.90 | 10.20 | 13.23 | 11.63 | 12.03 | 21.17 | 26.27 | 29.47 | 31.03 |
| 02 | Right | -0.27 | 5.77 | 8.97 | 13.07 | 12.73 | 14.00 | 19.63 | 24.40 | 25.97 | 27.33 |
| 03 | Left | -3.83 | 0.13 | 7.77 | 11.80 | 11.13 | 12.87 | 19.50 | 27.17 | 32.33 | 33.93 |
| 03 | Right | 1.23 | 5.70 | 10.03 | 14.67 | 14.40 | 17.30 | 28.00 | 27.90 | 28.17 | 31.73 |
| 04 | Left | 3.30 | 11.23 | 14.93 | 17.00 | 14.33 | 16.67 | 23.73 | 28.53 | 29.53 | 29.30 |
| 04 | Right | 9.13 | 13.93 | 14.33 | 16.03 | 15.47 | 16.87 | 25.77 | 33.10 | 29.67 | 29.77 |
| 05 | Left | -6.63 | -4.30 | 4.17 | 9.27 | 12.17 | 12.80 | 21.33 | 24.60 | 28.30 | 30.03 |
| 05 | Right | -3.37 | 2.53 | 6.27 | 11.27 | 12.07 | 12.77 | 20.17 | 24.70 | 29.10 | 32.13 |
| 06 | Left | -1.30 | 4.07 | 12.77 | 16.17 | 19.20 | 19.90 | 28.67 | 31.70 | 28.73 | 30.83 |
| 06 | Right | 1.40 | 6.57 | 9.77 | 14.47 | 18.57 | 21.20 | 30.20 | 32.57 | 32.20 | 32.27 |
| 07 | Left | 10.67 | 14.63 | 16.07 | 19.23 | 21.43 | 24.30 | 28.97 | 35.80 | 35.73 | 36.43 |
| 07 | Right | 4.63 | 11.60 | 15.73 | 17.60 | 20.10 | 23.43 | 30.47 | 31.00 | 29.03 | 35.30 |
| 08 | Left | 4.03 | 7.10 | 12.47 | 15.33 | 11.93 | 14.10 | 23.90 | 30.77 | 33.97 | 39.40 |
| 08 | Right | -2.47 | 2.63 | 6.90 | 11.37 | 11.83 | 14.20 | 21.87 | 28.80 | 32.63 | 34.90 |
| 09 | Left | 3.73 | 8.33 | 12.27 | 15.43 | 15.20 | 16.17 | 24.47 | 34.03 | 28.03 | 31.17 |
| 09 | Right | 0.23 | 5.50 | 8.80 | 13.50 | 14.63 | 17.30 | 27.47 | 29.13 | 26.30 | 27.80 |
| 10 | Left | 4.37 | 5.90 | 10.67 | 13.03 | 12.53 | 14.73 | 22.50 | 28.67 | 30.53 | 32.67 |
| 10 | Right | 0.57 | 5.30 | 7.93 | 10.73 | 11.50 | 14.13 | 24.17 | 29.30 | 29.57 | 29.93 |
| Insertion Loss (L) | Mean | 1.60 | 5.55 | 10.87 | 13.97 | 14.10 | 15.83 | 23.69 | 29.33 | 30.63 | 32.65 |
| | s | 4.84 | 5.35 | 3.63 | 3.28 | 3.56 | 3.75 | 3.08 | 3.68 | 2.57 | 3.14 |
| Insertion Loss (R) | Mean | 2.16 | 7.45 | 10.54 | 13.95 | 14.82 | 17.04 | 25.45 | 29.10 | 29.56 | 31.56 |
| | s | 4.59 | 4.44 | 3.70 | 2.40 | 2.96 | 3.45 | 3.89 | 2.90 | 2.45 | 2.83 |

Appendix B (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|-----------------------|-------------|---|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | | 2500 Hz | 3150 Hz | 4000 Hz | 5000 Hz | 6300 Hz | 8000 Hz | 10000 Hz | 12500 Hz | 16000 Hz | 20000 Hz |
| 01 | Left | 39.07 | 42.00 | 43.60 | 43.17 | 39.47 | 33.23 | 23.10 | 23.33 | 25.37 | 20.00 |
| 01 | Right | 43.47 | 44.57 | 46.93 | 44.10 | 43.53 | 35.23 | 28.87 | 28.10 | 29.00 | 20.00 |
| 02 | Left | 31.37 | 32.20 | 30.70 | 25.50 | 22.13 | 23.43 | 22.77 | 23.23 | 22.83 | 20.00 |
| 02 | Right | 28.23 | 30.23 | 32.90 | 26.30 | 24.90 | 24.13 | 23.53 | 26.00 | 23.93 | 19.87 |
| 03 | Left | 29.90 | 27.10 | 31.70 | 31.97 | 31.70 | 33.80 | 30.57 | 30.30 | 27.27 | 20.00 |
| 03 | Right | 31.67 | 28.83 | 34.30 | 28.37 | 24.70 | 28.03 | 28.07 | 26.53 | 24.87 | 16.67 |
| 04 | Left | 34.73 | 33.77 | 37.67 | 34.27 | 33.03 | 33.00 | 28.07 | 28.20 | 27.07 | 20.07 |
| 04 | Right | 33.20 | 33.53 | 40.50 | 38.83 | 34.47 | 36.40 | 34.13 | 33.40 | 27.33 | 20.00 |
| 05 | Left | 23.23 | 21.73 | 30.03 | 31.63 | 30.00 | 27.20 | 28.30 | 27.67 | 18.47 | 10.00 |
| 05 | Right | 24.20 | 26.13 | 28.43 | 30.43 | 32.43 | 24.37 | 25.27 | 27.57 | 19.83 | 10.00 |
| 06 | Left | 36.70 | 36.37 | 32.47 | 21.03 | 17.03 | 20.60 | 19.33 | 21.77 | 15.10 | 10.00 |
| 06 | Right | 34.83 | 36.53 | 36.30 | 28.53 | 23.93 | 23.73 | 27.10 | 28.00 | 23.27 | 20.00 |
| 07 | Left | 38.20 | 41.33 | 43.70 | 41.00 | 34.20 | 33.07 | 33.90 | 30.20 | 28.40 | 20.20 |
| 07 | Right | 40.20 | 42.27 | 41.87 | 38.40 | 29.07 | 29.33 | 27.63 | 19.67 | 18.53 | 20.00 |
| 08 | Left | 34.47 | 31.23 | 35.33 | 33.57 | 32.23 | 33.10 | 34.63 | 33.13 | 25.73 | 20.00 |
| 08 | Right | 31.83 | 30.47 | 35.17 | 32.40 | 34.67 | 24.30 | 23.17 | 28.03 | 20.67 | 10.00 |
| 09 | Left | 34.33 | 28.90 | 22.93 | 21.30 | 16.23 | 24.50 | 28.57 | 34.03 | 26.63 | 20.20 |
| 09 | Right | 32.97 | 27.97 | 26.90 | 21.93 | 17.27 | 23.03 | 22.00 | 23.73 | 22.00 | 20.03 |
| 10 | Left | 28.57 | 29.00 | 33.47 | 29.83 | 30.67 | 27.93 | 14.53 | 19.33 | 20.93 | 19.97 |
| 10 | Right | 29.47 | 29.67 | 29.63 | 21.97 | 26.63 | 22.73 | 19.73 | 20.40 | 21.10 | 20.13 |
| Insertion Loss (L) | Mean s | 33.06 4.85 | 32.36 6.29 | 34.16 6.31 | 31.33 7.38 | 28.67 7.65 | 28.99 4.90 | 26.38 6.39 | 27.12 4.99 | 23.78 4.36 | 18.04 4.24 |
| Insertion Loss (R) | Mean s | 33.01 5.58 | 33.02 6.21 | 35.29 6.35 | 31.13 7.37 | 29.16 7.37 | 27.13 5.05 | 25.95 4.12 | 26.14 4.03 | 23.05 3.32 | 17.67 4.17 |

Appendix C. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Army HGU-4/P aviator spectacle bayonet-style temples measured IAW ANSI S12.42-1995.

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|-------|-------|-------|-------|-------|--------|--------|--------|--------|
| | | 25 Hz | 31 Hz | 40 Hz | 50 Hz | 63 Hz | 80 Hz | 100 Hz | 125 Hz | 160 Hz | 200 Hz |
| 01 | Left | 11.00 | 10.97 | 7.20 | -1.73 | -0.90 | -1.47 | -2.73 | -4.20 | -5.17 | -4.03 |
| 01 | Right | 1.57 | 0.37 | 0.93 | -2.80 | -1.70 | -1.57 | -1.83 | 0.20 | 2.07 | 4.97 |
| 02 | Left | 10.03 | 10.13 | 5.50 | 2.40 | 0.47 | -1.30 | -2.30 | -4.27 | -3.73 | -1.73 |
| 02 | Right | 1.97 | 1.10 | -1.40 | 0.90 | -0.23 | -0.53 | -0.73 | -3.13 | -3.70 | -4.27 |
| 03 | Left | 11.17 | 11.27 | 9.40 | 2.20 | 1.00 | -0.47 | -1.37 | -2.60 | -1.77 | 0.87 |
| 03 | Right | 10.10 | 7.50 | 5.37 | 1.23 | -0.20 | -0.03 | -0.67 | -2.80 | -2.37 | -1.97 |
| 04 | Left | 8.83 | 7.03 | 3.63 | 0.33 | 1.03 | -0.20 | -1.80 | -2.87 | -1.87 | 1.60 |
| 04 | Right | -1.47 | -2.77 | -3.03 | -1.13 | 0.90 | 1.87 | 3.17 | 5.30 | 6.47 | 9.20 |
| 05 | Left | 8.63 | 8.57 | 6.77 | -2.93 | -2.33 | -1.87 | -2.23 | -3.60 | -5.13 | -6.53 |
| 05 | Right | 9.67 | 9.37 | 4.73 | -1.57 | -1.23 | -1.10 | -2.07 | -4.27 | -5.50 | -5.77 |
| 06 | Left | 9.30 | 8.73 | 7.47 | 2.90 | 1.67 | -0.27 | -2.80 | -7.00 | -7.30 | -7.43 |
| 06 | Right | 11.70 | 8.27 | 5.37 | 1.93 | 0.73 | -0.17 | -1.10 | -3.23 | -2.23 | 0.63 |
| 07 | Left | -3.87 | -6.43 | -7.37 | -2.50 | 2.57 | 1.63 | 1.57 | 3.37 | 5.67 | 6.20 |
| 07 | Right | -2.40 | -4.40 | -6.63 | -1.97 | -0.20 | 0.10 | 0.67 | 3.73 | 5.93 | 6.57 |
| 08 | Left | 7.83 | 5.57 | 1.70 | -1.50 | -1.87 | -2.67 | -1.47 | -0.30 | 1.43 | 4.00 |
| 08 | Right | 6.37 | 7.77 | 3.30 | -1.80 | -1.73 | -1.70 | -1.63 | -3.13 | -3.73 | -3.93 |
| 09 | Left | 11.07 | 12.60 | 10.17 | 1.73 | 1.30 | -0.47 | -0.80 | -1.97 | -0.87 | 0.73 |
| 09 | Right | 10.47 | 10.83 | 6.63 | 0.77 | 0.50 | -0.30 | -0.90 | -2.53 | -2.13 | 0.20 |
| 10 | Left | 9.07 | 8.40 | 5.60 | -2.07 | -1.70 | -1.50 | -2.87 | -2.73 | -2.07 | -0.60 |
| 10 | Right | 2.97 | 4.63 | 2.30 | -0.77 | -0.03 | 0.40 | 0.47 | 1.27 | 3.20 | 5.67 |
| Insertion Loss (L) | Mean | 8.31 | 7.68 | 5.01 | -0.12 | 0.12 | -0.86 | -1.68 | -2.62 | -2.08 | -0.69 |
| | s | 4.43 | 5.38 | 5.02 | 2.27 | 1.69 | 1.18 | 1.33 | 2.73 | 3.69 | 4.36 |
| Insertion Loss (R) | Mean | 5.09 | 4.27 | 1.76 | -0.52 | -0.32 | -0.30 | -0.46 | -0.86 | -0.20 | 1.13 |
| | s | 5.23 | 5.35 | 4.29 | 1.61 | 0.95 | 1.04 | 1.56 | 3.31 | 4.27 | 5.20 |

Appendix C (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|--------|--------|--------|--------|--------|---------|---------|---------|---------|
| | | 250 Hz | 315 Hz | 400 Hz | 500 Hz | 630 Hz | 800 Hz | 1000 Hz | 1250 Hz | 1600 Hz | 2000 Hz |
| 01 | Left | -3.50 | 0.03 | 4.30 | 6.47 | 8.63 | 11.50 | 20.30 | 25.73 | 28.57 | 30.27 |
| 01 | Right | 6.80 | 11.53 | 12.77 | 14.30 | 14.93 | 18.50 | 24.37 | 28.43 | 33.27 | 34.23 |
| 02 | Left | 0.93 | 4.87 | 9.70 | 12.83 | 11.23 | 11.80 | 22.10 | 25.73 | 28.17 | 28.33 |
| 02 | Right | -5.60 | -0.07 | 3.40 | 8.27 | 9.33 | 10.80 | 17.77 | 26.27 | 26.93 | 28.07 |
| 03 | Left | -3.27 | 0.20 | 7.57 | 11.97 | 11.23 | 12.57 | 20.37 | 28.70 | 34.13 | 36.40 |
| 03 | Right | -2.50 | 0.87 | 4.93 | 9.27 | 11.20 | 14.37 | 25.50 | 31.37 | 31.87 | 34.27 |
| 04 | Left | 3.13 | 8.97 | 14.27 | 15.80 | 14.33 | 16.53 | 23.13 | 28.27 | 30.17 | 31.20 |
| 04 | Right | 9.53 | 14.97 | 16.00 | 18.53 | 17.33 | 18.10 | 27.27 | 31.63 | 31.47 | 30.97 |
| 05 | Left | -8.87 | -6.27 | 2.83 | 7.80 | 11.13 | 11.67 | 19.10 | 22.73 | 27.90 | 32.50 |
| 05 | Right | -4.73 | 1.00 | 5.27 | 10.50 | 11.90 | 12.87 | 20.17 | 25.00 | 29.97 | 34.10 |
| 06 | Left | -2.57 | 3.23 | 12.07 | 15.43 | 18.20 | 20.20 | 28.70 | 30.43 | 27.83 | 29.90 |
| 06 | Right | 1.90 | 7.47 | 11.43 | 16.23 | 19.73 | 22.00 | 32.80 | 35.73 | 35.83 | 33.03 |
| 07 | Left | 9.33 | 12.83 | 15.63 | 17.73 | 21.73 | 23.00 | 31.93 | 36.30 | 34.13 | 36.27 |
| 07 | Right | 7.23 | 12.20 | 16.30 | 18.13 | 21.00 | 23.50 | 32.20 | 32.97 | 32.00 | 35.87 |
| 08 | Left | 6.57 | 10.27 | 14.07 | 16.90 | 12.10 | 15.23 | 24.80 | 32.17 | 33.80 | 39.30 |
| 08 | Right | -2.93 | 2.43 | 6.57 | 11.73 | 12.07 | 13.93 | 21.17 | 28.83 | 34.40 | 34.80 |
| 09 | Left | 1.90 | 6.73 | 10.73 | 13.20 | 13.37 | 15.43 | 23.90 | 34.07 | 28.03 | 30.27 |
| 09 | Right | -0.10 | 4.67 | 7.67 | 12.57 | 13.30 | 17.20 | 27.67 | 28.30 | 25.57 | 28.13 |
| 10 | Left | 2.30 | 4.63 | 9.60 | 11.87 | 11.73 | 13.77 | 21.40 | 25.33 | 27.83 | 31.07 |
| 10 | Right | 5.37 | 8.67 | 9.47 | 11.07 | 12.20 | 14.17 | 24.50 | 29.20 | 30.43 | 31.87 |
| Insertion Loss (L) | Mean | 0.60 | 4.55 | 10.08 | 13.00 | 13.37 | 15.17 | 23.57 | 28.95 | 30.06 | 32.55 |
| | s | 5.32 | 5.61 | 4.23 | 3.70 | 3.87 | 3.86 | 4.03 | 4.29 | 2.82 | 3.55 |
| Insertion Loss (R) | Mean | 1.50 | 6.37 | 9.38 | 13.06 | 14.30 | 16.54 | 25.34 | 29.77 | 31.17 | 32.53 |
| | s | 5.46 | 5.37 | 4.60 | 3.61 | 3.87 | 4.06 | 4.89 | 3.20 | 3.15 | 2.73 |

Appendix C (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|-----------------------|-------------|---|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | | 2500 Hz | 3150 Hz | 4000 Hz | 5000 Hz | 6300 Hz | 8000 Hz | 10000 Hz | 12500 Hz | 16000 Hz | 20000 Hz |
| 01 | Left | 37.03 | 36.73 | 37.80 | 38.40 | 34.90 | 31.30 | 22.83 | 23.43 | 24.40 | 20.00 |
| 01 | Right | 42.67 | 43.17 | 44.23 | 41.83 | 38.97 | 32.20 | 26.67 | 27.80 | 28.03 | 20.00 |
| 02 | Left | 29.57 | 33.97 | 30.23 | 25.13 | 20.93 | 20.63 | 18.47 | 22.50 | 21.70 | 20.00 |
| 02 | Right | 25.27 | 27.03 | 29.47 | 24.23 | 24.40 | 21.97 | 25.47 | 24.57 | 24.20 | 11.27 |
| 03 | Left | 30.73 | 26.60 | 31.17 | 32.37 | 28.70 | 31.03 | 31.67 | 31.20 | 26.43 | 20.00 |
| 03 | Right | 28.37 | 24.57 | 30.03 | 25.10 | 24.50 | 21.53 | 25.97 | 24.97 | 21.63 | 16.67 |
| 04 | Left | 37.47 | 32.70 | 36.80 | 32.60 | 33.43 | 29.53 | 28.83 | 28.63 | 26.40 | 20.00 |
| 04 | Right | 33.33 | 34.83 | 40.90 | 41.00 | 37.33 | 37.33 | 33.33 | 32.00 | 27.27 | 20.00 |
| 05 | Left | 22.10 | 21.87 | 29.57 | 29.37 | 27.70 | 25.17 | 26.90 | 24.93 | 20.63 | 10.23 |
| 05 | Right | 24.17 | 24.10 | 23.67 | 27.30 | 31.60 | 26.67 | 27.33 | 27.43 | 21.97 | 10.17 |
| 06 | Left | 36.20 | 35.20 | 31.97 | 21.07 | 16.63 | 19.87 | 19.73 | 24.03 | 15.17 | 10.00 |
| 06 | Right | 35.20 | 38.43 | 37.77 | 26.23 | 23.57 | 22.63 | 25.40 | 27.40 | 23.53 | 20.00 |
| 07 | Left | 36.83 | 42.03 | 43.43 | 40.97 | 38.43 | 33.97 | 32.37 | 32.67 | 26.70 | 23.47 |
| 07 | Right | 39.00 | 42.17 | 43.03 | 44.07 | 37.40 | 32.07 | 31.77 | 24.57 | 23.43 | 20.00 |
| 08 | Left | 35.37 | 33.13 | 37.33 | 34.70 | 32.77 | 32.03 | 33.60 | 32.07 | 25.73 | 20.00 |
| 08 | Right | 32.77 | 30.70 | 34.57 | 33.30 | 34.30 | 25.70 | 27.33 | 27.93 | 20.30 | 10.00 |
| 09 | Left | 31.93 | 27.03 | 23.10 | 21.93 | 18.30 | 24.97 | 28.90 | 32.73 | 25.63 | 20.23 |
| 09 | Right | 32.83 | 28.27 | 27.67 | 25.43 | 18.37 | 19.83 | 19.70 | 20.07 | 18.77 | 19.87 |
| 10 | Left | 28.40 | 29.03 | 32.97 | 28.70 | 27.67 | 25.97 | 14.20 | 17.87 | 16.37 | 19.87 |
| 10 | Right | 32.90 | 33.37 | 34.00 | 33.57 | 37.10 | 25.07 | 23.77 | 28.23 | 22.83 | 20.13 |
| Insertion Loss (L) | Mean s | 32.56 4.98 | 31.83 5.81 | 33.44 5.63 | 30.52 6.61 | 27.95 7.32 | 27.45 4.87 | 25.75 6.60 | 27.01 5.17 | 22.92 4.29 | 18.38 4.49 |
| Insertion Loss (R) | Mean s | 32.65 5.70 | 32.66 6.94 | 34.53 6.90 | 32.21 7.70 | 30.75 7.40 | 26.50 5.66 | 26.67 3.83 | 26.50 3.16 | 23.20 2.85 | 16.81 4.50 |

Appendix D. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with cable-style templates measured IAW ANSI S12.42-1995.

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|--------|-------|-------|-------|-------|--------|--------|--------|--------|
| | | 25 Hz | 31 Hz | 40 Hz | 50 Hz | 63 Hz | 80 Hz | 100 Hz | 125 Hz | 160 Hz | 200 Hz |
| 01 | Left | -0.67 | 1.77 | 5.20 | 3.23 | 2.37 | 2.10 | 2.17 | 2.33 | 2.97 | 4.93 |
| | Right | -12.43 | -10.83 | -2.93 | 6.23 | 7.23 | 9.10 | 10.63 | 10.27 | 10.10 | 12.70 |
| 02 | Left | 3.10 | 5.43 | 1.87 | 4.77 | 3.57 | 0.47 | 0.60 | 0.53 | 1.53 | 2.47 |
| | Right | -3.53 | -3.23 | -2.37 | 0.77 | 0.23 | -0.90 | -0.67 | -2.83 | -2.73 | -1.17 |
| 03 | Left | 10.60 | 11.03 | 8.93 | 2.03 | 1.00 | 0.07 | -1.10 | -2.07 | -1.43 | -0.17 |
| | Right | 5.37 | 4.77 | 5.13 | 0.83 | 0.53 | 1.27 | 0.30 | -1.30 | -0.77 | -0.40 |
| 04 | Left | 2.33 | 0.33 | 1.03 | 0.90 | 9.90 | 5.53 | 3.67 | 3.80 | 5.47 | 7.97 |
| | Right | -7.97 | -7.10 | -3.83 | 2.27 | 5.53 | 5.83 | 7.23 | 9.03 | 9.90 | 11.60 |
| 05 | Left | 8.67 | 9.17 | 7.50 | -1.90 | -2.20 | -2.30 | -3.27 | -4.43 | -5.33 | -5.43 |
| | Right | 9.53 | 9.33 | 5.27 | -0.43 | -0.87 | -1.03 | -2.20 | -3.97 | -4.73 | -5.17 |
| 06 | Left | 7.90 | 2.97 | 1.10 | 0.77 | 1.60 | -0.73 | -1.73 | -1.27 | 0.50 | 1.03 |
| | Right | 1.90 | -1.90 | -0.87 | 0.47 | 1.87 | 1.57 | 1.87 | 2.43 | 3.73 | 4.97 |
| 07 | Left | -5.90 | -7.00 | -2.90 | 5.17 | 8.80 | 6.07 | 5.90 | 7.67 | 9.23 | 8.40 |
| | Right | -10.00 | -6.40 | -0.37 | 7.07 | 7.63 | 7.47 | 8.67 | 10.07 | 10.67 | 10.57 |
| 08 | Left | 5.87 | 5.10 | 4.97 | 0.90 | -0.23 | -0.10 | 0.03 | 0.77 | 1.73 | 4.50 |
| | Right | 4.57 | 7.07 | 3.90 | -1.43 | -1.73 | -1.00 | -1.60 | -3.17 | -2.87 | -1.70 |
| 09 | Left | 1.40 | 3.53 | 7.70 | 3.53 | 2.97 | 1.53 | 2.50 | 3.80 | 4.90 | 5.33 |
| | Right | 5.17 | 4.83 | 4.47 | 1.10 | 0.83 | 0.70 | 1.53 | 1.97 | 2.77 | 5.33 |
| 10 | Left | -1.47 | -2.33 | -2.80 | -1.30 | 1.87 | 2.43 | 2.03 | 4.50 | 5.10 | 4.77 |
| | Right | -6.80 | -4.30 | -3.53 | 0.93 | 2.37 | 4.23 | 5.30 | 5.90 | 6.90 | 9.70 |
| Insertion Loss (L) | Mean | 3.18 | 3.00 | 3.26 | 1.81 | 2.96 | 1.51 | 1.08 | 1.56 | 2.47 | 3.38 |
| | s | 5.14 | 5.27 | 4.25 | 2.39 | 3.75 | 2.66 | 2.73 | 3.58 | 4.07 | 4.11 |
| Insertion Loss (R) | Mean | -1.42 | -0.78 | 0.49 | 1.78 | 2.36 | 2.72 | 3.11 | 2.84 | 3.30 | 4.64 |
| | s | 7.66 | 6.82 | 3.79 | 2.75 | 3.32 | 3.71 | 4.54 | 5.65 | 5.90 | 6.41 |

Appendix D (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|--------|--------|--------|--------|--------|---------|---------|---------|---------|
| | | 250 Hz | 315 Hz | 400 Hz | 500 Hz | 630 Hz | 800 Hz | 1000 Hz | 1250 Hz | 1600 Hz | 2000 Hz |
| 01 | Left | 6.27 | 9.13 | 10.50 | 11.67 | 14.27 | 17.00 | 25.13 | 28.27 | 31.50 | 33.53 |
| 01 | Right | 14.47 | 17.67 | 18.97 | 18.73 | 18.33 | 21.20 | 28.20 | 31.47 | 34.90 | 35.00 |
| 02 | Left | 5.63 | 8.57 | 13.67 | 14.87 | 13.27 | 13.40 | 21.87 | 27.07 | 28.77 | 29.17 |
| 02 | Right | 0.17 | 5.43 | 7.57 | 10.37 | 10.03 | 12.37 | 20.07 | 27.87 | 29.57 | 31.53 |
| 03 | Left | -2.30 | 0.97 | 8.90 | 12.77 | 11.30 | 12.33 | 20.13 | 27.67 | 32.13 | 34.23 |
| 03 | Right | -0.33 | 3.93 | 8.03 | 12.47 | 13.10 | 16.70 | 27.47 | 30.80 | 31.23 | 34.73 |
| 04 | Left | 8.53 | 15.27 | 16.50 | 17.83 | 16.03 | 17.77 | 26.27 | 29.00 | 29.63 | 31.73 |
| 04 | Right | 11.53 | 16.63 | 16.50 | 18.63 | 17.07 | 17.57 | 26.93 | 32.67 | 31.37 | 31.67 |
| 05 | Left | -5.57 | -2.43 | 6.27 | 11.20 | 13.33 | 13.80 | 22.53 | 25.80 | 31.80 | 34.43 |
| 05 | Right | -5.60 | -0.13 | 3.37 | 8.43 | 10.03 | 11.23 | 18.70 | 22.93 | 27.63 | 32.70 |
| 06 | Left | 5.47 | 9.53 | 16.07 | 18.30 | 19.77 | 20.00 | 27.40 | 33.17 | 34.47 | 35.80 |
| 06 | Right | 6.00 | 11.53 | 14.83 | 18.83 | 20.97 | 23.13 | 31.47 | 33.23 | 35.20 | 34.23 |
| 07 | Left | 11.07 | 14.97 | 17.50 | 19.30 | 22.63 | 24.77 | 32.67 | 37.03 | 36.53 | 37.43 |
| 07 | Right | 10.33 | 15.60 | 19.43 | 21.43 | 23.70 | 26.00 | 34.87 | 33.93 | 32.23 | 34.60 |
| 08 | Left | 7.07 | 10.30 | 12.83 | 15.57 | 11.83 | 14.80 | 25.87 | 31.37 | 33.00 | 39.13 |
| 08 | Right | -0.33 | 4.43 | 8.57 | 11.93 | 11.40 | 13.80 | 20.87 | 28.67 | 33.27 | 35.07 |
| 09 | Left | 6.33 | 10.33 | 12.60 | 14.23 | 14.83 | 16.67 | 25.03 | 34.67 | 32.43 | 31.57 |
| 09 | Right | 4.17 | 9.43 | 11.90 | 16.23 | 15.90 | 18.30 | 27.70 | 28.73 | 26.13 | 28.70 |
| 10 | Left | 9.20 | 10.33 | 13.33 | 15.23 | 13.03 | 14.93 | 23.40 | 27.43 | 30.43 | 32.97 |
| 10 | Right | 8.63 | 11.37 | 11.07 | 13.17 | 12.97 | 15.10 | 25.77 | 29.80 | 30.23 | 31.50 |
| Insertion Loss (L) | Mean | 5.17 | 8.70 | 12.82 | 15.10 | 15.03 | 16.55 | 25.03 | 30.15 | 32.07 | 34.00 |
| | s | 5.16 | 5.53 | 3.51 | 2.77 | 3.59 | 3.68 | 3.48 | 3.73 | 2.28 | 2.93 |
| Insertion Loss (R) | Mean | 4.90 | 9.59 | 12.02 | 15.02 | 15.35 | 17.54 | 26.20 | 30.01 | 31.18 | 32.97 |
| | s | 6.40 | 6.04 | 5.32 | 4.33 | 4.67 | 4.76 | 5.10 | 3.23 | 2.93 | 2.11 |

Appendix D (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| | | 2500 Hz | 3150 Hz | 4000 Hz | 5000 Hz | 6300 Hz | 8000 Hz | 10000 Hz | 12500 Hz | 16000 Hz | 20000 Hz |
| 01 | Left | 40.20 | 42.27 | 45.47 | 44.90 | 42.47 | 33.73 | 26.17 | 32.20 | 25.97 | 20.00 |
| 01 | Right | 43.13 | 44.20 | 47.97 | 46.30 | 46.43 | 36.17 | 32.23 | 33.63 | 29.40 | 29.80 |
| 02 | Left | 31.97 | 35.17 | 37.77 | 29.00 | 27.63 | 24.57 | 21.63 | 27.00 | 25.20 | 20.00 |
| 02 | Right | 28.20 | 29.37 | 31.40 | 24.80 | 27.40 | 23.43 | 25.03 | 25.47 | 24.07 | 17.87 |
| 03 | Left | 30.27 | 26.57 | 32.53 | 31.17 | 31.43 | 34.07 | 32.97 | 31.40 | 27.57 | 20.00 |
| 03 | Right | 30.07 | 26.67 | 32.77 | 26.23 | 25.47 | 23.93 | 27.63 | 21.93 | 22.87 | 16.67 |
| 04 | Left | 37.53 | 35.63 | 40.07 | 34.67 | 34.93 | 25.00 | 23.60 | 28.40 | 27.53 | 23.23 |
| 04 | Right | 31.60 | 35.70 | 41.17 | 41.40 | 37.50 | 38.17 | 33.30 | 32.50 | 27.63 | 23.27 |
| 05 | Left | 20.73 | 21.13 | 32.83 | 31.10 | 26.33 | 27.67 | 31.20 | 25.83 | 21.40 | 10.20 |
| 05 | Right | 26.67 | 27.93 | 27.27 | 28.57 | 28.37 | 28.47 | 28.70 | 25.67 | 21.47 | 10.07 |
| 06 | Left | 39.27 | 40.00 | 38.10 | 27.37 | 23.00 | 24.53 | 21.73 | 24.57 | 23.07 | 20.00 |
| 06 | Right | 35.37 | 41.43 | 42.17 | 31.83 | 27.10 | 21.70 | 25.07 | 30.73 | 26.10 | 20.00 |
| 07 | Left | 37.43 | 41.53 | 43.40 | 39.33 | 36.17 | 31.17 | 30.53 | 31.87 | 26.70 | 29.93 |
| 07 | Right | 38.23 | 43.27 | 47.93 | 46.77 | 39.57 | 36.03 | 31.70 | 26.73 | 24.13 | 29.70 |
| 08 | Left | 36.00 | 32.60 | 37.37 | 32.40 | 29.00 | 31.03 | 32.43 | 34.87 | 26.07 | 20.00 |
| 08 | Right | 33.03 | 32.47 | 37.33 | 31.07 | 30.00 | 25.90 | 24.57 | 28.57 | 25.63 | 20.00 |
| 09 | Left | 31.03 | 27.50 | 29.80 | 27.80 | 27.83 | 29.50 | 34.93 | 34.13 | 26.63 | 20.23 |
| 09 | Right | 35.77 | 33.90 | 31.77 | 31.57 | 25.17 | 24.27 | 22.63 | 21.93 | 21.57 | 19.93 |
| 10 | Left | 31.83 | 31.87 | 37.60 | 39.73 | 39.37 | 36.77 | 24.63 | 27.90 | 25.73 | 20.00 |
| 10 | Right | 33.33 | 36.10 | 39.77 | 36.60 | 39.37 | 29.27 | 27.30 | 30.10 | 26.27 | 20.20 |
| Insertion Loss (L) | Mean | 33.63 | 33.43 | 37.49 | 33.75 | 31.82 | 29.80 | 27.98 | 29.82 | 25.59 | 20.36 |
| | s | 5.78 | 6.92 | 4.84 | 5.83 | 6.22 | 4.33 | 4.98 | 3.55 | 1.96 | 4.76 |
| Insertion Loss (R) | Mean | 33.54 | 35.10 | 37.95 | 34.51 | 32.64 | 28.73 | 27.82 | 27.73 | 24.91 | 20.75 |
| | s | 4.88 | 6.28 | 7.10 | 7.94 | 7.44 | 6.02 | 3.63 | 4.09 | 2.58 | 5.86 |

Appendix E. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Army HGU-4/P aviator spectacle with cable-style temples measured IAW ANSI S12.42-1995.

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|--------|-------|-------|-------|-------|--------|--------|--------|--------|
| | | 25 Hz | 31 Hz | 40 Hz | 50 Hz | 63 Hz | 80 Hz | 100 Hz | 125 Hz | 160 Hz | 200 Hz |
| 01 | Left | -0.23 | 3.00 | 5.73 | 4.40 | 3.50 | 2.93 | 2.80 | 2.90 | 3.30 | 4.77 |
| | Right | -11.03 | -10.87 | -5.77 | 3.47 | 5.57 | 7.37 | 9.73 | 10.23 | 9.67 | 11.83 |
| 02 | Left | 6.27 | 7.03 | 2.53 | 2.80 | 1.70 | -0.33 | -1.70 | -2.77 | -1.77 | -0.80 |
| | Right | -9.67 | -8.57 | -5.40 | 1.53 | 1.00 | 0.83 | 1.23 | 0.60 | 1.40 | 4.23 |
| 03 | Left | 8.03 | 8.70 | 9.03 | 3.53 | 2.50 | 1.00 | -0.17 | -1.43 | -0.77 | 0.27 |
| | Right | 5.03 | 4.50 | 4.83 | 2.17 | 1.43 | 1.67 | 1.10 | -1.33 | -0.90 | -0.93 |
| 04 | Left | 6.90 | 5.13 | 4.10 | 3.17 | 5.07 | 2.00 | 0.47 | 0.40 | 2.17 | 6.53 |
| | Right | -2.53 | -3.37 | -0.13 | 1.60 | 3.07 | 3.67 | 5.63 | 7.30 | 8.30 | 10.33 |
| 05 | Left | 8.77 | 9.10 | 7.30 | -3.00 | -2.83 | -3.03 | -3.90 | -4.47 | -5.07 | -4.30 |
| | Right | 9.53 | 9.53 | 5.67 | -0.27 | -0.60 | -1.10 | -2.63 | -4.57 | -5.23 | -5.33 |
| 06 | Left | 7.80 | 2.63 | 0.63 | 5.20 | 4.33 | 1.07 | 0.13 | 0.83 | 2.47 | 1.67 |
| | Right | 1.80 | -1.10 | -0.30 | 3.20 | 3.27 | 3.33 | 3.47 | 4.17 | 5.67 | 7.07 |
| 07 | Left | -8.90 | -9.43 | -7.27 | 2.63 | 6.63 | 5.80 | 6.73 | 8.27 | 9.87 | 9.57 |
| | Right | -7.23 | -7.07 | -4.57 | 3.37 | 4.50 | 5.47 | 7.30 | 8.40 | 9.30 | 9.10 |
| 08 | Left | 13.63 | 11.90 | 7.90 | -3.00 | -3.53 | -3.30 | -3.43 | -3.83 | -3.70 | -1.73 |
| | Right | 5.73 | 6.83 | 4.10 | -1.50 | -2.30 | -2.00 | -1.93 | -2.63 | -2.13 | -1.03 |
| 09 | Left | -4.43 | -3.17 | -1.07 | 3.97 | 6.60 | 4.43 | 5.00 | 6.20 | 7.60 | 9.43 |
| | Right | -4.73 | -4.83 | -3.37 | 1.17 | 1.93 | 2.60 | 3.50 | 4.40 | 5.40 | 7.70 |
| 10 | Left | -1.63 | -1.83 | -1.13 | 2.47 | 7.13 | 6.20 | 5.83 | 7.20 | 7.57 | 7.60 |
| | Right | 0.20 | 0.03 | 2.50 | 1.23 | 2.20 | 3.20 | 5.13 | 5.70 | 6.77 | 8.97 |
| Insertion Loss (L) | Mean | 3.62 | 3.31 | 2.78 | 2.22 | 3.11 | 1.68 | 1.18 | 1.33 | 2.17 | 3.30 |
| | s | 7.04 | 6.54 | 5.08 | 2.87 | 3.77 | 3.31 | 3.78 | 4.65 | 5.06 | 4.94 |
| Insertion Loss (R) | Mean | -1.29 | -1.49 | -0.24 | 1.60 | 2.01 | 2.50 | 3.25 | 3.23 | 3.82 | 5.19 |
| | s | 6.93 | 6.77 | 4.38 | 1.60 | 2.32 | 2.82 | 3.91 | 4.98 | 5.21 | 5.75 |

Appendix E (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|--------|--------|--------|--------|--------|---------|---------|---------|---------|
| | | 250 Hz | 315 Hz | 400 Hz | 500 Hz | 630 Hz | 800 Hz | 1000 Hz | 1250 Hz | 1600 Hz | 2000 Hz |
| 01 | Left | 7.23 | 9.03 | 10.83 | 11.67 | 14.67 | 17.30 | 25.17 | 29.30 | 33.27 | 34.73 |
| 01 | Right | 13.47 | 16.20 | 17.87 | 17.63 | 17.50 | 20.57 | 28.17 | 32.53 | 35.63 | 36.30 |
| 02 | Left | 3.07 | 6.93 | 12.17 | 14.70 | 11.83 | 13.13 | 22.37 | 28.20 | 31.23 | 31.17 |
| 02 | Right | 4.83 | 8.57 | 10.23 | 12.77 | 11.43 | 12.60 | 20.13 | 26.13 | 26.93 | 28.97 |
| 03 | Left | -1.53 | 2.13 | 9.10 | 13.43 | 11.60 | 12.80 | 20.63 | 29.33 | 34.57 | 36.57 |
| 03 | Right | -1.30 | 2.17 | 6.57 | 11.90 | 12.77 | 15.73 | 26.43 | 29.20 | 28.80 | 32.20 |
| 04 | Left | 7.20 | 14.97 | 15.23 | 16.43 | 13.70 | 15.97 | 23.60 | 27.17 | 28.43 | 29.63 |
| 04 | Right | 10.30 | 15.43 | 16.30 | 18.67 | 16.33 | 17.23 | 26.83 | 33.40 | 31.17 | 31.70 |
| 05 | Left | -4.63 | -1.93 | 6.20 | 10.27 | 12.83 | 13.07 | 22.23 | 24.70 | 29.17 | 31.90 |
| 05 | Right | -5.40 | 0.77 | 4.47 | 9.23 | 11.77 | 12.63 | 20.37 | 25.23 | 29.20 | 32.50 |
| 06 | Left | 6.23 | 10.87 | 17.90 | 20.50 | 21.43 | 21.40 | 28.10 | 33.77 | 35.57 | 36.80 |
| 06 | Right | 7.40 | 13.03 | 16.17 | 20.17 | 21.77 | 24.13 | 33.37 | 34.27 | 35.03 | 35.23 |
| 07 | Left | 11.00 | 15.30 | 17.37 | 19.67 | 22.63 | 23.37 | 30.97 | 35.87 | 33.77 | 36.20 |
| 07 | Right | 8.87 | 14.43 | 19.47 | 21.50 | 23.37 | 26.60 | 34.70 | 32.27 | 30.73 | 34.40 |
| 08 | Left | 0.93 | 2.87 | 10.33 | 12.50 | 10.13 | 12.43 | 23.13 | 29.00 | 32.90 | 38.30 |
| 08 | Right | 0.10 | 5.07 | 9.20 | 13.07 | 12.40 | 14.63 | 21.03 | 27.93 | 34.87 | 35.37 |
| 09 | Left | 9.87 | 13.57 | 15.17 | 17.40 | 17.13 | 18.07 | 25.97 | 35.83 | 31.30 | 32.90 |
| 09 | Right | 5.87 | 11.17 | 13.60 | 17.47 | 17.07 | 20.13 | 28.77 | 31.40 | 28.07 | 29.37 |
| 10 | Left | 11.57 | 12.67 | 13.97 | 15.40 | 13.30 | 15.30 | 24.63 | 28.43 | 30.37 | 33.97 |
| 10 | Right | 8.23 | 11.17 | 10.97 | 12.57 | 13.03 | 15.23 | 27.03 | 31.10 | 30.43 | 31.40 |
| Insertion Loss (L) | Mean | 5.09 | 8.64 | 12.83 | 15.20 | 14.93 | 16.28 | 24.68 | 30.16 | 32.06 | 34.22 |
| | s | 5.48 | 5.97 | 3.76 | 3.37 | 4.20 | 3.78 | 3.06 | 3.74 | 2.34 | 2.80 |
| Insertion Loss (R) | Mean | 5.24 | 9.80 | 12.48 | 15.50 | 15.74 | 17.95 | 26.68 | 30.35 | 31.09 | 32.74 |
| | s | 5.80 | 5.50 | 4.99 | 4.09 | 4.23 | 4.78 | 5.06 | 3.09 | 3.10 | 2.53 |

Appendix E (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| | | 2500 Hz | 3150 Hz | 4000 Hz | 5000 Hz | 6300 Hz | 8000 Hz | 10000 Hz | 12500 Hz | 16000 Hz | 20000 Hz |
| 01 | Left | 40.87 | 43.37 | 46.27 | 42.77 | 41.87 | 32.00 | 23.73 | 31.63 | 25.60 | 20.00 |
| 01 | Right | 42.53 | 44.40 | 47.63 | 43.70 | 42.03 | 31.50 | 27.73 | 31.13 | 28.33 | 29.40 |
| 02 | Left | 31.10 | 33.37 | 32.90 | 26.83 | 25.20 | 22.90 | 25.10 | 28.40 | 25.10 | 20.00 |
| 02 | Right | 29.13 | 32.83 | 35.50 | 28.00 | 28.60 | 24.13 | 28.17 | 28.90 | 26.73 | 21.17 |
| 03 | Left | 31.63 | 27.50 | 33.33 | 31.40 | 30.83 | 32.03 | 31.37 | 32.53 | 26.60 | 20.00 |
| 03 | Right | 28.77 | 24.37 | 31.20 | 26.37 | 27.13 | 26.53 | 28.97 | 24.57 | 22.67 | 13.33 |
| 04 | Left | 34.80 | 34.10 | 38.43 | 34.23 | 31.77 | 26.23 | 22.57 | 26.43 | 25.90 | 20.07 |
| 04 | Right | 34.03 | 35.17 | 40.13 | 40.23 | 36.23 | 31.83 | 32.77 | 32.50 | 26.63 | 20.00 |
| 05 | Left | 22.83 | 23.70 | 33.70 | 33.03 | 29.77 | 30.80 | 31.07 | 28.83 | 23.70 | 13.57 |
| 05 | Right | 24.80 | 26.43 | 27.10 | 27.77 | 26.17 | 26.00 | 27.53 | 25.87 | 21.77 | 10.10 |
| 06 | Left | 39.13 | 39.83 | 38.37 | 27.47 | 22.73 | 21.87 | 20.50 | 24.63 | 23.80 | 20.00 |
| 06 | Right | 36.83 | 41.43 | 43.13 | 34.20 | 27.90 | 23.00 | 26.90 | 26.93 | 24.97 | 20.00 |
| 07 | Left | 36.67 | 42.33 | 44.90 | 43.90 | 38.47 | 30.47 | 33.77 | 35.40 | 29.90 | 30.00 |
| 07 | Right | 38.77 | 42.07 | 46.60 | 44.33 | 35.70 | 29.77 | 31.13 | 25.07 | 22.27 | 26.47 |
| 08 | Left | 33.00 | 29.93 | 32.50 | 32.17 | 27.13 | 27.67 | 29.83 | 32.07 | 25.83 | 20.00 |
| 08 | Right | 33.40 | 32.93 | 38.67 | 32.67 | 30.30 | 31.20 | 28.23 | 30.17 | 25.30 | 16.67 |
| 09 | Left | 36.50 | 32.77 | 32.87 | 29.40 | 27.27 | 32.00 | 35.47 | 37.13 | 27.77 | 26.77 |
| 09 | Right | 38.93 | 38.53 | 35.83 | 33.47 | 25.43 | 26.73 | 26.33 | 26.87 | 26.03 | 20.10 |
| 10 | Left | 34.57 | 37.27 | 41.37 | 35.33 | 34.73 | 32.00 | 27.80 | 28.30 | 25.70 | 26.57 |
| 10 | Right | 34.63 | 38.77 | 39.07 | 36.27 | 36.10 | 23.03 | 28.13 | 32.33 | 27.67 | 20.00 |
| Insertion Loss (L) | Mean | 34.11 | 34.42 | 37.46 | 33.65 | 30.98 | 28.80 | 28.12 | 30.54 | 25.99 | 21.70 |
| | s | 5.03 | 6.39 | 5.25 | 5.79 | 5.97 | 3.93 | 5.00 | 3.93 | 1.82 | 4.73 |
| Insertion Loss (R) | Mean | 34.18 | 35.69 | 38.49 | 34.70 | 31.56 | 27.37 | 28.59 | 28.43 | 25.24 | 19.72 |
| | s | 5.42 | 6.64 | 6.44 | 6.46 | 5.57 | 3.48 | 1.95 | 2.98 | 2.31 | 5.62 |

Appendix F. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Navy FG with skull-style temples measured IAW ANSI S12.42-1995.

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|--------|-------|-------|-------|-------|--------|--------|--------|--------|
| | | 25 Hz | 31 Hz | 40 Hz | 50 Hz | 63 Hz | 80 Hz | 100 Hz | 125 Hz | 160 Hz | 200 Hz |
| 01 | Left | -1.23 | 0.60 | 2.33 | 3.63 | 2.53 | 2.30 | 2.53 | 3.27 | 4.07 | 6.03 |
| 01 | Right | -13.50 | -11.70 | -4.57 | 6.73 | 6.87 | 9.10 | 10.83 | 10.43 | 9.80 | 13.30 |
| 02 | Left | 0.93 | 3.97 | -0.40 | 3.80 | 2.97 | 0.53 | 1.20 | 2.03 | 3.33 | 4.03 |
| 02 | Right | -4.33 | -3.43 | -1.90 | 0.60 | -0.13 | -0.93 | -0.73 | -2.53 | -2.50 | -1.27 |
| 03 | Left | 10.60 | 11.57 | 9.50 | 2.60 | 1.87 | -0.10 | -0.93 | -1.83 | -1.07 | 1.40 |
| 03 | Right | 9.27 | 7.13 | 5.60 | 0.60 | 0.13 | -0.23 | -1.07 | -2.77 | -2.10 | -2.20 |
| 04 | Left | 2.57 | 0.13 | 1.90 | 4.20 | 9.77 | 4.53 | 2.67 | 3.47 | 4.50 | 7.23 |
| 04 | Right | -1.37 | -1.77 | 1.90 | 2.27 | 3.43 | 4.27 | 5.27 | 7.73 | 9.20 | 10.33 |
| 05 | Left | 8.53 | 9.07 | 6.93 | -1.37 | -1.53 | -2.43 | -3.20 | -4.93 | -5.57 | -5.00 |
| 05 | Right | 9.60 | 9.33 | 5.43 | -0.27 | -0.53 | -1.33 | -2.13 | -4.47 | -5.30 | -4.93 |
| 06 | Left | 12.10 | 7.17 | 4.20 | 2.47 | 0.53 | -0.83 | -2.27 | -2.60 | -1.33 | -1.60 |
| 06 | Right | 11.27 | 9.73 | 4.23 | -1.77 | -2.17 | -1.80 | -2.73 | -3.87 | -4.10 | -3.03 |
| 07 | Left | -10.90 | -10.20 | -6.33 | 2.93 | 8.07 | 6.60 | 7.30 | 8.40 | 9.77 | 11.23 |
| 07 | Right | -11.10 | -7.37 | -3.70 | 4.60 | 6.47 | 6.83 | 8.67 | 10.13 | 10.57 | 10.07 |
| 08 | Left | 4.97 | 4.60 | 5.13 | 0.20 | -0.30 | -0.03 | 0.23 | 1.33 | 2.73 | 5.37 |
| 08 | Right | 5.87 | 7.73 | 4.30 | -1.13 | -1.47 | -1.27 | -1.73 | -2.93 | -2.63 | -2.30 |
| 09 | Left | 3.33 | 6.73 | 8.47 | 3.73 | 3.03 | 1.40 | 2.30 | 3.60 | 5.17 | 6.43 |
| 09 | Right | 5.63 | 5.63 | 4.30 | 0.43 | 0.30 | -0.20 | 0.10 | -0.13 | 0.90 | 3.63 |
| 10 | Left | 3.53 | 2.70 | 4.03 | 0.57 | 2.33 | 2.07 | 1.73 | 2.27 | 3.10 | 5.07 |
| 10 | Right | -0.87 | 1.33 | 2.73 | 1.20 | 1.83 | 3.10 | 4.80 | 5.53 | 6.80 | 9.60 |
| Insertion Loss (L) | Mean | 3.44 | 3.63 | 3.58 | 2.28 | 2.93 | 1.40 | 1.16 | 1.50 | 2.47 | 4.02 |
| | s | 6.58 | 6.05 | 4.61 | 1.86 | 3.51 | 2.64 | 2.97 | 3.79 | 4.22 | 4.65 |
| Insertion Loss (R) | Mean | 1.05 | 1.66 | 1.83 | 1.33 | 1.47 | 1.75 | 2.13 | 1.71 | 2.06 | 3.32 |
| | s | 8.74 | 7.49 | 3.82 | 2.60 | 3.16 | 3.86 | 4.88 | 6.06 | 6.32 | 6.88 |

Appendix F (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|--------|--------|--------|--------|--------|---------|---------|---------|---------|
| | | 250 Hz | 315 Hz | 400 Hz | 500 Hz | 630 Hz | 800 Hz | 1000 Hz | 1250 Hz | 1600 Hz | 2000 Hz |
| 01 | Left | 7.87 | 10.57 | 12.37 | 12.97 | 14.23 | 16.87 | 24.40 | 30.17 | 31.73 | 32.83 |
| 01 | Right | 14.83 | 18.80 | 19.10 | 17.67 | 16.80 | 19.93 | 26.53 | 30.90 | 35.23 | 35.90 |
| 02 | Left | 6.90 | 8.30 | 12.13 | 14.23 | 13.77 | 14.00 | 22.10 | 26.80 | 28.50 | 28.67 |
| 02 | Right | -0.97 | 4.33 | 6.87 | 10.33 | 9.47 | 12.00 | 19.43 | 27.33 | 29.90 | 32.33 |
| 03 | Left | -2.00 | 1.87 | 9.03 | 12.97 | 11.10 | 12.97 | 20.00 | 27.47 | 30.70 | 32.13 |
| 03 | Right | -1.90 | 2.00 | 6.33 | 11.00 | 12.40 | 15.20 | 25.93 | 30.20 | 29.93 | 33.70 |
| 04 | Left | 9.23 | 16.30 | 16.07 | 16.93 | 14.27 | 17.13 | 25.27 | 26.97 | 28.57 | 31.70 |
| 04 | Right | 10.73 | 16.07 | 16.60 | 19.60 | 17.43 | 17.63 | 26.07 | 30.77 | 30.57 | 30.63 |
| 05 | Left | -6.50 | -2.37 | 6.17 | 11.13 | 13.07 | 13.30 | 22.60 | 27.13 | 32.63 | 33.27 |
| 05 | Right | -5.17 | 0.43 | 3.77 | 8.87 | 10.47 | 11.60 | 20.20 | 24.83 | 29.70 | 33.67 |
| 06 | Left | 4.37 | 8.00 | 16.00 | 18.70 | 20.00 | 20.43 | 26.67 | 31.33 | 34.40 | 37.17 |
| 06 | Right | -1.63 | 4.47 | 8.27 | 13.87 | 16.77 | 19.20 | 28.60 | 33.10 | 32.60 | 30.50 |
| 07 | Left | 12.10 | 16.70 | 16.80 | 19.57 | 21.63 | 23.80 | 30.77 | 36.90 | 35.40 | 37.47 |
| 07 | Right | 10.23 | 15.27 | 19.33 | 21.07 | 24.03 | 26.80 | 35.10 | 31.97 | 30.67 | 34.17 |
| 08 | Left | 7.10 | 10.83 | 13.93 | 16.20 | 12.37 | 14.80 | 24.83 | 31.40 | 33.97 | 39.73 |
| 08 | Right | -1.27 | 4.10 | 8.20 | 11.80 | 11.47 | 13.30 | 21.30 | 28.47 | 34.23 | 35.90 |
| 09 | Left | 6.67 | 10.50 | 13.30 | 15.10 | 15.63 | 17.27 | 25.50 | 36.23 | 29.27 | 31.33 |
| 09 | Right | 2.93 | 7.90 | 10.87 | 14.70 | 15.43 | 18.67 | 27.83 | 29.97 | 27.33 | 29.53 |
| 10 | Left | 6.53 | 9.07 | 11.60 | 13.23 | 12.73 | 13.97 | 23.03 | 25.20 | 27.27 | 32.13 |
| 10 | Right | 7.40 | 10.13 | 10.70 | 13.33 | 14.03 | 16.07 | 26.93 | 32.80 | 30.50 | 32.27 |
| Insertion Loss (L) | Mean | 5.23 | 8.98 | 12.74 | 15.10 | 14.88 | 16.45 | 24.52 | 29.96 | 31.24 | 33.64 |
| | s | 5.49 | 5.79 | 3.31 | 2.72 | 3.38 | 3.47 | 2.93 | 4.05 | 2.82 | 3.39 |
| Insertion Loss (R) | Mean | 3.52 | 8.35 | 11.00 | 14.22 | 14.83 | 17.04 | 25.79 | 30.03 | 31.07 | 32.86 |
| | s | 6.79 | 6.43 | 5.51 | 4.07 | 4.28 | 4.53 | 4.63 | 2.56 | 2.33 | 2.21 |

Appendix F (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| | | 2500 Hz | 3150 Hz | 4000 Hz | 5000 Hz | 6300 Hz | 8000 Hz | 10000 Hz | 12500 Hz | 16000 Hz | 20000 Hz |
| 01 | Left | 40.30 | 41.30 | 42.60 | 40.60 | 38.03 | 32.13 | 30.33 | 30.40 | 25.07 | 23.23 |
| 01 | Right | 42.70 | 44.70 | 45.97 | 47.00 | 47.93 | 39.97 | 32.10 | 33.23 | 31.67 | 29.77 |
| 02 | Left | 31.47 | 36.33 | 38.87 | 31.27 | 27.70 | 25.03 | 23.47 | 27.40 | 24.77 | 20.00 |
| 02 | Right | 26.53 | 28.30 | 30.63 | 23.50 | 23.87 | 21.17 | 23.10 | 24.27 | 25.13 | 18.13 |
| 03 | Left | 30.20 | 26.60 | 32.13 | 32.83 | 29.57 | 32.67 | 31.87 | 30.30 | 27.67 | 20.00 |
| 03 | Right | 28.57 | 24.47 | 29.97 | 24.33 | 22.43 | 20.03 | 26.57 | 20.60 | 21.00 | 16.67 |
| 04 | Left | 38.73 | 36.17 | 39.57 | 35.67 | 35.17 | 26.50 | 23.77 | 28.93 | 26.73 | 26.57 |
| 04 | Right | 32.70 | 35.63 | 40.70 | 38.83 | 35.87 | 35.83 | 32.30 | 30.73 | 26.10 | 20.00 |
| 05 | Left | 21.30 | 21.77 | 31.73 | 29.10 | 25.93 | 25.93 | 31.37 | 26.13 | 25.73 | 16.93 |
| 05 | Right | 27.00 | 28.07 | 26.87 | 27.67 | 28.83 | 27.30 | 26.13 | 24.60 | 20.77 | 10.00 |
| 06 | Left | 37.20 | 38.33 | 38.30 | 26.60 | 23.30 | 25.20 | 24.73 | 25.53 | 23.20 | 20.00 |
| 06 | Right | 31.67 | 32.90 | 32.00 | 31.40 | 21.53 | 19.37 | 22.73 | 28.73 | 22.07 | 13.33 |
| 07 | Left | 37.60 | 40.70 | 44.50 | 42.70 | 38.27 | 33.30 | 34.33 | 34.53 | 30.00 | 26.70 |
| 07 | Right | 38.57 | 40.90 | 46.13 | 44.20 | 37.10 | 32.97 | 31.93 | 24.53 | 21.27 | 25.70 |
| 08 | Left | 36.07 | 33.93 | 37.87 | 35.60 | 32.60 | 35.13 | 34.73 | 36.00 | 26.23 | 20.00 |
| 08 | Right | 33.53 | 32.07 | 37.27 | 32.53 | 31.97 | 29.80 | 26.40 | 28.60 | 25.07 | 16.67 |
| 09 | Left | 36.93 | 33.23 | 33.17 | 29.20 | 26.23 | 29.33 | 32.00 | 35.77 | 26.93 | 20.20 |
| 09 | Right | 36.03 | 33.07 | 30.33 | 31.23 | 22.10 | 22.07 | 21.60 | 22.77 | 21.60 | 19.90 |
| 10 | Left | 31.40 | 32.27 | 36.93 | 37.53 | 35.77 | 31.67 | 28.67 | 30.40 | 25.53 | 20.00 |
| 10 | Right | 35.07 | 38.07 | 37.00 | 35.83 | 37.30 | 24.07 | 27.87 | 31.93 | 27.03 | 20.00 |
| Insertion Loss (L) | Mean | 34.12 | 34.06 | 37.57 | 34.11 | 31.26 | 29.69 | 29.53 | 30.54 | 26.19 | 21.36 |
| | s | 5.65 | 6.10 | 4.26 | 5.25 | 5.43 | 3.77 | 4.21 | 3.80 | 1.84 | 3.15 |
| Insertion Loss (R) | Mean | 33.24 | 33.82 | 35.69 | 33.65 | 30.89 | 27.26 | 27.07 | 27.00 | 24.17 | 19.02 |
| | s | 5.14 | 6.19 | 6.85 | 7.88 | 8.73 | 7.17 | 3.99 | 4.23 | 3.51 | 5.66 |

Appendix G. Mean and standard deviations of the insertion loss of the HGU-56/P AIHS worn with U.S. Air Force IAS with skull-style temples measured IAW ANSI S12.42-1995.

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|--------|-------|-------|-------|-------|--------|--------|--------|--------|
| | | 25 Hz | 31 Hz | 40 Hz | 50 Hz | 63 Hz | 80 Hz | 100 Hz | 125 Hz | 160 Hz | 200 Hz |
| 01 | Left | 6.57 | 7.03 | 4.10 | -1.03 | -0.70 | -0.37 | -0.97 | -1.37 | -2.20 | -1.43 |
| 01 | Right | -12.53 | -11.40 | -6.03 | 4.57 | 6.40 | 8.30 | 8.73 | 10.03 | 9.77 | 12.47 |
| 02 | Left | 0.87 | 4.47 | 1.70 | 3.67 | 2.50 | 1.17 | 0.53 | 1.03 | 2.10 | 2.67 |
| 02 | Right | -4.37 | -3.47 | -2.97 | -1.23 | -1.03 | -0.57 | -1.23 | -1.90 | -1.60 | 0.50 |
| 03 | Left | 14.23 | 12.23 | 9.13 | 1.07 | 0.03 | -0.70 | -1.77 | -2.37 | -1.87 | -0.70 |
| 03 | Right | 9.77 | 9.43 | 5.77 | 0.73 | -0.53 | -0.07 | -1.00 | -3.33 | -3.70 | -5.37 |
| 04 | Left | 2.03 | -0.53 | 0.80 | 2.53 | 10.53 | 5.50 | 4.10 | 4.07 | 5.93 | 7.00 |
| 04 | Right | -4.63 | -5.80 | -0.97 | 3.83 | 6.23 | 7.83 | 8.07 | 9.13 | 10.17 | 11.60 |
| 05 | Left | 8.43 | 8.53 | 6.73 | -1.00 | -0.97 | -1.33 | -3.10 | -5.07 | -5.60 | -4.70 |
| 05 | Right | 9.27 | 9.27 | 5.50 | -0.20 | -0.37 | -0.33 | -2.13 | -4.63 | -5.23 | -5.27 |
| 06 | Left | 9.87 | 7.47 | 5.20 | 1.07 | 0.10 | -1.87 | -3.47 | -5.20 | -4.10 | -4.37 |
| 06 | Right | 8.60 | 7.10 | 3.00 | -0.90 | -0.97 | -1.70 | -2.10 | -2.43 | -0.80 | 0.87 |
| 07 | Left | -11.17 | -10.33 | -7.43 | 2.73 | 8.67 | 7.23 | 8.27 | 9.07 | 10.60 | 9.73 |
| 07 | Right | -10.87 | -8.60 | -4.63 | 4.07 | 7.70 | 7.60 | 9.63 | 10.57 | 11.30 | 11.03 |
| 08 | Left | 2.00 | 1.63 | 2.27 | -0.53 | -0.47 | -0.63 | 0.37 | 1.63 | 2.70 | 4.80 |
| 08 | Right | 3.93 | 5.20 | 2.07 | -1.07 | -1.17 | -1.03 | -1.37 | -2.73 | -3.03 | -1.97 |
| 09 | Left | 0.20 | 1.37 | 4.70 | 5.43 | 5.40 | 2.87 | 3.57 | 4.97 | 7.17 | 8.83 |
| 09 | Right | 0.13 | -0.33 | 0.67 | 1.13 | 1.40 | 1.53 | 2.30 | 3.17 | 4.60 | 6.93 |
| 10 | Left | -0.13 | -1.23 | 1.07 | 2.50 | 2.60 | 3.17 | 2.37 | 4.03 | 4.70 | 5.63 |
| 10 | Right | -0.43 | 0.37 | 2.50 | 3.40 | 2.60 | 4.20 | 5.47 | 5.57 | 6.80 | 9.03 |
| Insertion Loss (L) | Mean | 3.29 | 3.06 | 2.83 | 1.64 | 2.77 | 1.50 | 0.99 | 1.08 | 1.94 | 2.75 |
| | s | 6.99 | 6.39 | 4.47 | 2.13 | 4.13 | 3.09 | 3.65 | 4.62 | 5.29 | 5.29 |
| Insertion Loss (R) | Mean | -0.11 | 0.18 | 0.49 | 1.43 | 2.03 | 2.58 | 2.64 | 2.34 | 2.83 | 3.98 |
| | s | 8.07 | 7.47 | 4.06 | 2.32 | 3.50 | 4.03 | 4.87 | 6.07 | 6.39 | 7.02 |

Appendix G (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|--------|--------|--------|--------|--------|---------|---------|---------|---------|
| | | 250 Hz | 315 Hz | 400 Hz | 500 Hz | 630 Hz | 800 Hz | 1000 Hz | 1250 Hz | 1600 Hz | 2000 Hz |
| 01 | Left | -0.17 | 2.80 | 6.63 | 8.43 | 10.13 | 12.50 | 21.23 | 26.93 | 30.20 | 31.53 |
| 01 | Right | 13.87 | 17.90 | 18.27 | 18.07 | 15.93 | 20.07 | 26.90 | 32.43 | 35.60 | 37.17 |
| 02 | Left | 5.67 | 8.23 | 13.47 | 14.67 | 13.23 | 13.30 | 22.27 | 27.20 | 29.50 | 29.67 |
| 02 | Right | 0.93 | 5.93 | 7.47 | 10.10 | 10.07 | 12.03 | 19.90 | 28.33 | 28.33 | 30.30 |
| 03 | Left | -3.03 | 0.20 | 7.60 | 11.70 | 11.50 | 12.83 | 21.30 | 29.83 | 35.13 | 34.70 |
| 03 | Right | -5.83 | -2.10 | 2.60 | 7.77 | 10.67 | 13.90 | 23.33 | 28.77 | 31.97 | 33.10 |
| 04 | Left | 8.57 | 15.37 | 16.90 | 19.03 | 15.73 | 17.33 | 26.33 | 30.00 | 30.93 | 33.33 |
| 04 | Right | 11.07 | 17.77 | 17.13 | 20.40 | 17.83 | 18.57 | 27.90 | 33.10 | 31.93 | 32.27 |
| 05 | Left | -4.03 | -0.57 | 7.37 | 11.97 | 13.90 | 14.30 | 23.13 | 26.50 | 31.73 | 33.97 |
| 05 | Right | -4.77 | 1.03 | 4.73 | 9.97 | 11.20 | 12.67 | 20.23 | 25.07 | 30.03 | 33.80 |
| 06 | Left | 1.23 | 5.87 | 14.10 | 17.23 | 18.00 | 18.57 | 26.47 | 28.30 | 31.00 | 33.67 |
| 06 | Right | 2.13 | 8.10 | 11.03 | 15.63 | 18.23 | 20.43 | 30.33 | 33.40 | 33.53 | 32.30 |
| 07 | Left | 12.63 | 16.07 | 17.83 | 19.57 | 21.27 | 23.93 | 32.57 | 37.77 | 34.83 | 36.73 |
| 07 | Right | 11.07 | 15.37 | 18.90 | 22.03 | 24.13 | 27.20 | 35.57 | 34.70 | 32.43 | 34.67 |
| 08 | Left | 7.70 | 10.43 | 13.50 | 16.03 | 12.37 | 15.13 | 24.13 | 30.87 | 33.03 | 38.33 |
| 08 | Right | -0.50 | 4.43 | 8.50 | 11.80 | 12.77 | 14.53 | 22.10 | 30.20 | 33.13 | 35.07 |
| 09 | Left | 8.97 | 12.87 | 14.43 | 16.83 | 15.73 | 17.23 | 25.23 | 35.27 | 30.93 | 33.03 |
| 09 | Right | 5.83 | 10.80 | 12.67 | 15.43 | 16.10 | 19.17 | 28.10 | 31.60 | 28.27 | 29.60 |
| 10 | Left | 8.03 | 9.87 | 12.50 | 14.27 | 13.30 | 14.90 | 24.00 | 25.43 | 27.47 | 31.53 |
| 10 | Right | 8.20 | 10.80 | 11.50 | 13.23 | 13.33 | 16.20 | 27.40 | 32.63 | 30.43 | 30.53 |
| Insertion Loss (L) | Mean | 4.56 | 8.11 | 12.43 | 14.97 | 14.52 | 16.00 | 24.67 | 29.81 | 31.48 | 33.65 |
| | s | 5.66 | 5.95 | 3.95 | 3.50 | 3.28 | 3.45 | 3.35 | 3.97 | 2.35 | 2.54 |
| Insertion Loss (R) | Mean | 4.20 | 9.00 | 11.28 | 14.44 | 15.03 | 17.48 | 26.18 | 31.02 | 31.57 | 32.88 |
| | s | 6.87 | 6.84 | 5.61 | 4.72 | 4.34 | 4.59 | 4.87 | 2.92 | 2.32 | 2.38 |

Appendix G (continued):

| Subject Number | Test Ear | Third-octave test band center frequency | | | | | | | | | |
|--------------------|----------|---|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| | | 2500 Hz | 3150 Hz | 4000 Hz | 5000 Hz | 6300 Hz | 8000 Hz | 10000 Hz | 12500 Hz | 16000 Hz | 20000 Hz |
| 01 | Left | 38.13 | 38.17 | 39.53 | 40.37 | 34.67 | 33.77 | 31.90 | 31.77 | 25.10 | 20.00 |
| 01 | Right | 42.67 | 44.73 | 45.83 | 45.50 | 43.97 | 43.60 | 34.60 | 33.80 | 32.73 | 29.77 |
| 02 | Left | 32.53 | 35.57 | 38.03 | 29.37 | 27.90 | 24.23 | 22.87 | 27.10 | 26.27 | 20.00 |
| 02 | Right | 26.50 | 29.20 | 32.03 | 26.70 | 25.70 | 22.13 | 26.10 | 28.70 | 26.00 | 21.30 |
| 03 | Left | 30.67 | 25.90 | 30.87 | 30.20 | 27.57 | 31.87 | 31.53 | 29.40 | 28.83 | 20.00 |
| 03 | Right | 25.00 | 21.00 | 24.70 | 19.13 | 18.87 | 17.73 | 23.60 | 19.70 | 19.83 | 10.00 |
| 04 | Left | 38.67 | 36.67 | 40.20 | 37.77 | 35.97 | 24.13 | 25.83 | 31.10 | 26.17 | 29.83 |
| 04 | Right | 32.40 | 37.10 | 41.50 | 46.77 | 41.03 | 35.60 | 32.13 | 31.80 | 27.10 | 29.83 |
| 05 | Left | 22.70 | 23.13 | 32.90 | 31.57 | 27.30 | 30.17 | 31.30 | 26.17 | 25.60 | 16.93 |
| 05 | Right | 26.20 | 26.90 | 26.70 | 25.23 | 27.17 | 25.43 | 27.67 | 23.17 | 20.90 | 10.13 |
| 06 | Left | 38.20 | 37.43 | 35.30 | 26.57 | 19.60 | 21.43 | 22.03 | 25.77 | 21.30 | 16.67 |
| 06 | Right | 32.67 | 35.70 | 35.67 | 34.67 | 24.37 | 21.83 | 26.13 | 28.13 | 24.93 | 20.00 |
| 07 | Left | 37.07 | 41.57 | 43.67 | 42.10 | 37.40 | 33.47 | 31.60 | 32.63 | 26.27 | 29.97 |
| 07 | Right | 38.90 | 42.80 | 49.17 | 46.70 | 41.17 | 37.63 | 33.37 | 25.77 | 23.23 | 29.53 |
| 08 | Left | 34.67 | 32.43 | 36.83 | 35.33 | 32.93 | 34.77 | 32.77 | 34.83 | 25.77 | 20.00 |
| 08 | Right | 33.40 | 31.83 | 38.00 | 30.13 | 32.60 | 26.77 | 26.77 | 27.27 | 27.30 | 20.00 |
| 09 | Left | 36.10 | 30.90 | 30.20 | 27.47 | 25.80 | 31.60 | 34.90 | 36.07 | 27.10 | 20.20 |
| 09 | Right | 36.83 | 36.00 | 34.87 | 33.00 | 22.90 | 24.80 | 25.73 | 27.03 | 24.73 | 20.17 |
| 10 | Left | 30.53 | 32.17 | 35.37 | 37.50 | 35.50 | 26.53 | 27.00 | 26.53 | 21.67 | 20.00 |
| 10 | Right | 33.57 | 37.93 | 38.13 | 35.33 | 39.07 | 22.07 | 28.63 | 28.87 | 24.10 | 20.00 |
| Insertion Loss (L) | Mean s | 33.93 | 33.39 | 36.29 | 33.82 | 30.46 | 29.20 | 29.17 | 30.14 | 25.41 | 21.36 |
| | s | 4.99 | 5.69 | 4.26 | 5.52 | 5.70 | 4.73 | 4.42 | 3.72 | 2.30 | 4.69 |
| Insertion Loss (R) | Mean s | 32.81 | 34.32 | 36.66 | 34.32 | 31.68 | 27.76 | 28.47 | 27.42 | 25.09 | 21.07 |
| | s | 5.74 | 7.23 | 7.72 | 9.57 | 9.04 | 8.33 | 3.66 | 4.01 | 3.62 | 7.23 |